



Environment

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Classroom Study Material



ENVIRONMENT

(May 2017 – February 2018)

Table of Contents

1. CLIMATE CHANGE	3	2.7. Global Clean Seas Campaign	27
1.1. Global Scenario	3	2.8. Moss as Bioindicator	27
1.1.1. UN Emission Gap Report 2017	3	3. BIODIVERSITY	29
1.1.2. Climate Change Performance Index (CCPI)	4	3.1. India State of Forest Report 2017	29
1.1.3. Earth Overshoot Day	4	3.2. Increase in India's Biodiversity	30
1.1.4. Green Growth	4	3.3. Invasive Alien Species	31
1.1.5. CO ₂ in Atmosphere Hits Record High: UN	5	3.4. Fauna	31
1.1.6. Environmental Performance Index	5	3.4.1. Irrawaddy Dolphin	31
1.2. Mitigation Measures	5	3.4.2. Indian Star Tortoises	32
1.2.1. Carbon Market	5	3.4.3. Northern River Terrapin (Batagur Baska)	32
1.2.2. Carbon Sink	6	3.4.4. Indian Wild Dogs (Dholes)	33
1.2.3. Green Climate Fund	7	3.4.5. Bustard Breeding Center	33
1.2.4. Geo Engineering	7	3.4.6. Black Necked Crane	34
1.2.5. Combating Desertification	8	3.4.7. Amur Falcon	34
1.2.6. Land Degradation Neutrality Fund	8	3.4.8. Sangai Deer	34
1.2.7. Global Seed Vault	8	3.4.9. Mouse Deer	34
1.2.8. Artificial Reefs To Save Sinking Islands	9	3.4.10. Nilgiri Tahr	35
1.2.9. Microbes to Clean Contamination	9	3.4.11. Chiru Antelope	35
1.3. International Cooperation	10	3.4.12. New Moth Species	35
1.3.1. Bonn Climate Meet	10	3.4.13. Biodiversity Around the Deep-Sea Vents	36
1.3.2. Ecosystems Service Improvement Project	12	3.5. Flora	36
1.3.3. UN Ocean Conference	13	3.5.1. Sunderbans Steadily Losing Its Famed Mangroves	36
1.3.4. World Sustainable Development Summit 2018	13	3.5.2. Bamboo is No Longer a Tree	37
1.3.5. Sustainable Biofuels	14	3.5.3. Cobra Lily	38
2. POLLUTION	16	3.5.4. Red Sanders	38
2.1. Air Pollution	16	3.5.5. Nilambur Teak	39
2.1.1. Delhi Air Pollution	16	3.6. Conservation Measures	39
2.1.2. Ban on Polluting Fuels	17	3.6.1. Global Wildlife Program	39
2.1.3. Ban on the Use of Chemicals in Firecrackers	17	3.6.2. National Wildlife Action Plan (NWAP) for 2017-2031	39
2.1.4. Sulphur Dioxide Emissions in India	18	3.6.3. Secure Himalaya	39
2.1.5. Excessive Nitrogen in Atmosphere	19	3.6.4. India Awarded by CITES	41
2.1.6. Aerosols Causes Shrinking of India's Monsoon	20	3.6.5. Tiger Conservation	41
2.1.7. Urban Heat Island	20	3.6.6. Elephant Census	42
2.1.8. Dust Mitigation Plan	20	3.6.7. Special Protection Force for One-Horned Rhinos	43
2.1.9. Ash Track	21	3.6.8. Blackbuck Conservation Reserve	44
2.1.10. Ozone Protection	22	3.6.9. Crocodile Conservation in Bhitarkanika	44
2.1.11. Black Carbon in Stratosphere	23	3.6.10. Conservation of Migratory Species of Wild Animals	45
2.2. Light Pollution	23	3.6.11. Important Bird and Biodiversity Areas	45
2.3. Solid Waste	23	3.6.12. Asian Waterfowl Census 2018	46
2.3.1. Guideline for Odour Pollution	23	3.6.13. Biodiversity Heritage Sites	46
2.3.2. Star Rating Protocol for Garbage Free Cities	24	3.6.14. Ganga Conservation	47
2.4. Plastic Pollution	25	3.6.15. Doubling of Protected Areas	49
2.5. Pesticide Poisoning	26	3.6.16. New Wetland Conservation Rules	49
2.6. Minamata Convention	26		



3.6.17. New Guidelines on Compensatory Afforestation	51
3.6.18. Threat to Sacred Groves	52
3.6.19. Green Skill Development Programme	52
3.6.20. Scheme for Protection of Majuli Island	52
3.6.21. Deep Sea Trawling	53
3.6.22. Project 'Blue Flag' for Beach Clean-Up	53
3.6.23. Floating Treatment Wetland	54

4. SUSTAINABLE DEVELOPMENT 55

4.1. Green Building Rating System	55
4.2. LEED for Cities	55
4.3. Electric Vehicle	56
4.4. Guideline for Ground Water Usages by Industry	56
4.5. Environment Impact Assessment	57
4.6. Sustainable Tourism	57
4.7. Mangalajodi Ecotourism Trust	57
4.8. Permaculture	58
4.9. Zero Budget Natural Farming	58
4.10. Development of Solar Cities	59
4.11. Gobardhan Yojana	59

4.12. Combustible Ice	59
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5. DISASTER MANAGEMENT 61

5.1. Cyclones	61
5.2. Indian Tsunami Early Warning System	62
5.3. Floods	62
5.4. Change in Definition of Drought	63
5.5. Dam Safety	63
5.6. Disaster Resilient Infrastructure	64
5.7. India Quake and Sagar Vani	65

6. GEOGRAPHY 66

6.1. Exploration of Polymetallic Nodules	66
6.2. Sedimentary Basins of India	66
6.3. Coastal Erosion	67
6.4. Pacific Shadow Zone	67
6.5. El Nino Aided in Massive Carbon Dioxide Release	68

7. MISCELLANEOUS TIT BITS 69

1. CLIMATE CHANGE

1.1. GLOBAL SCENARIO

1.1.1. UN EMISSION GAP REPORT 2017

Why in news?

Recently, eighth edition of **UN Environment's Emissions Gap report** was unveiled.

Highlights

- It focuses on the difference between the emissions level the countries have pledged to achieve under international agreements (INDCs) and the level consistent with limiting warming to well below 2 degrees C.
- **Insignificant Commitment:** INDC pledges submitted by countries to reduce current emissions are only about one-third of what is needed to prevent catastrophic temperature increases by “at least” 3°C from pre-industrial levels by the year 2100.
- **Greenhouse emissions:** Though the total global greenhouse gas emissions continue to increase, the rate of growth has decreased over the past few years.



- **Effect of short-lived climate pollutants (SLCP):** It has been estimated that SLCP mitigation has the potential to avoid up to 0.6°C of warming by mid-century.

- **Exploring “negative emission technologies”** for removing carbon dioxide from the atmosphere as an additional way to mitigate climate change, over and above conventional abatement strategies.
- It has pointed that three of the G20 parties — **China, the EU, and India — are on track to meet their Cancun climate pledges** (In Cancun summit of UNFCCC, Mexico, in 2011, nations had agreed to GHG emission cuts ahead of 2020).

SLCP include a variety of gases that have short-term warming effects often in excess of CO₂, but don't stay in the atmosphere as long. These include **methane, HFCs, black carbon (soot), tropospheric ozone** etc.

The Climate and Clean Air Coalition is a voluntary partnership of governments, intergovernmental organizations, businesses etc. committed to reduce short-lived climate pollutants with over 120 state and non-state partners. It was initiated in 2012 by governments of Bangladesh, Canada, Ghana, Mexico, Sweden and the United States, along with the United Nations Environment Programme (UNEP).

Paris Agreement

- At the Paris climate conference (**COP21**) in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal.
- The agreement sets out a global action plan to put the world on track to avoid dangerous climate change by **limiting global warming to well below 2°C** above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels.
- It requires each Party to prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve.

India's NDC - India plans to

- Reduce its emissions intensity by **33 - 35% between 2005 and 2030**.
- Achieve 40% of its cumulative electric power from non-fossil fuel-based energy resources by 2030.
- Increase carbon sinks by creating an additional capacity equivalent to 2.5 to 3 billion tonnes of CO₂ through significant afforestation efforts by 2030.



1.1.2. CLIMATE CHANGE PERFORMANCE INDEX (CCPI)

Why in news?

Recently, India has been ranked **14th in Climate Change Performance Index (CCPI)**.

Climate Change Performance Index (CCPI)

- It is issued by Germanwatch, the New Climate Institute, and the Climate Action Network.
- The report ranks **56 countries and the European Union**, which together are responsible for 90% of global greenhouse gas emissions.
- Countries are ranked across **four categories** — **Greenhouse Gas Emissions, Renewable Energy, Energy Use, and Climate Policy**.

Highlights of index

- India improved its ranking from 20th in 2017 to 14th in 2018, on account for reducing greenhouse gas (GHG) emissions and adopting more clean sources of energy.
- Top three positions on the Index still **remain unoccupied** as no country is currently on a Paris Climate Agreement-compatible pathway.

1.1.3. EARTH OVERSHOOT DAY

Why in News?

In 2017, **Earth Overshoot Day** fell on August 2, the earliest date since ecological overshoot began in the early 1970s.

What is it?

- It is the date when humanity annual demand on nature exceeds what Earth can regenerate over the entire year.
- It is calculated by **WWF and Global Footprint Network**.
- It signifies that we have emitted more carbon than the oceans and forests can absorb in a year.
- In 2007 it fell on 15th August.

World Wide Fund for Nature (WWF)

- Switzerland based International **NGO**, estd. in 1961 and engages in conservation of wildlife and natural habitat.

Objectives

- Conserving the world's **biological diversity**.
- Ensuring that the use of **renewable natural resources** is sustainable.

- Promoting the reduction of **pollution** and wasteful consumption.
- Enhancing **active participation** of all sections of society in nature conservation and environmental protection.

Reports and initiatives

- **Living planet report** based on Living planet index and ecological footprint
- **Earth Hour** with other voluntary organizations-It was first organized in 2007 at Sydney, in which individuals, businesses and organizations **turn off their lights for 60 minutes** to show the government that climate change was an issue they cared about.
- **Debt-for-Nature Swap**- Agreement that reduces a developing country's debt in exchange for a commitment to protect nature was first undertaken by WWF. Currently it is also being undertaken by UNDP and other organizations.

Global Footprint Network

- It is an **international nonprofit organization** founded in 2003 to enable a sustainable future where all people have the opportunity to thrive within the means of one planet.

1.1.4. GREEN GROWTH

Why in News?

- In June 2017, OECD released a report titled **"Green Growth Indicators 2017"** highlighting the slow progress in achieving the Green Growth.

What is Green Growth?

- It is fostering economic growth and development while ensuring the natural assets continue to provide the resource and environment services on which our well-being relies.
- It is measured by **Green Growth Indicators** covering everything from land use to CO2 productivity and innovation like **Environmental and resource productivity, The natural asset base, Environmental dimension of quality of life, Economic opportunities and policy responses**

Highlights of report

- China and the US extract the most non-energy raw materials followed by India and Brazil (mostly biomass), and South Africa and Canada (mostly metals).
- About 90% of green technologies originate in OECD countries, but the contributions of China and India are rising fast.



Global Green Growth Institution (GGGI)

- Headquartered in Seoul (South Korea) it is a treaty based inter-governmental organization.
- India is **not founding member** but associated with research work.
- Established in 2012, at the Rio+20 United Nations Conference on Sustainable Development.
- Initiative on Green Growth and Development** in India is a collaborative project of Global Green Growth Institute (GGGI) and The Energy and Resources Institute (TERI).

1.1.5 CO₂ IN ATMOSPHERE HITS RECORD HIGH: UN

Why in news?

According to the **World Meteorological Organization's (WMO) Greenhouse Gas Bulletin**, the concentration of carbon dioxide (CO₂) in the atmosphere has hit a new high.

About WMO

- It is a specialized agency of the **United Nation**.
- It studies the behavior of the Earth's atmosphere, its interaction with the oceans, the climate it produces and the resulting distribution of water resources.
- Greenhouse Gas Bulletin** is WMO annual flagship report, which tracks concentrations of gasses in the atmosphere in the post-industrial era (since 1750).

Global Atmosphere Watch (GAW) programme of WMO

- It provides reliable scientific data and information on the chemical composition of the atmosphere, its natural and anthropogenic change, and helps to improve the understanding of interactions between the atmosphere, the oceans and the biosphere.
- GAW focal areas are aerosols, greenhouse gases, selected reactive gases, ozone, UV radiation and precipitation chemistry (or atmospheric deposition).

Related information

- According to report, concentrations of CO₂ are now 145% of pre-industrial (before 1750) levels.
- Atmospheric methane** reached a new high of about 257% of the pre-industrial level.
- NO₂ atmospheric concentration** in 2016 was 122% of pre-industrial levels.

1.1.6. ENVIRONMENTAL PERFORMANCE INDEX

Why in news?

India ranked 177 out of 180 in recently released Environmental Performance Index.

About Environmental Performance Index

- It is biennial index produced jointly by **Yale University and Columbia University** in collaboration with the **World Economic Forum**.
- The EPI ranks countries on 24 performance indicators across 10 issue categories which are: **Air quality, Water and sanitation, Heavy metals, Biodiversity and Habitat, Forests, Fisheries, Climate and energy, Air pollution, Water resource and Agriculture**.
- Switzerland is ranked first followed by France and Denmark

1.2. MITIGATION MEASURES

1.2.1. CARBON MARKET

Why in news?

Recently China formally launched its National Carbon Market.

Emission Trading

- It is a **market-based approach** to control air pollution by creating tradable pollution credits to add profit motive as an incentive for good performers unlike the traditional methods of penalty.
- 'Emission Trading' as a concept was introduced under the Kyoto Protocol as central element in form of **Clean Development Mechanism**. Under the mechanism the countries which have extra credits to spare can sell them to the countries which have over-shot their targets
- "Joint implementation"** is a programme under the Kyoto Protocol that allows industrialized countries to meet part of their required cuts in greenhouse-gas emissions by paying for projects that reduce emissions in other industrialized countries.
- At present, the European Union's emission trading scheme is world's largest.

About PAT (perform, achieve & trade) scheme

- In India, **PAT** was introduced in 2012 under the **National Mission for Enhanced Energy**

Efficiency (NMEEE) to be implemented by **Bureau of Energy Efficiency (Ministry of Power)**.

National Mission for Enhanced Energy Efficiency (NMEEE)

It is one of the eight national missions under the **National Action Plan on Climate Change (NAPCC)**. NMEEE consist of four initiatives to enhance energy efficiency in energy intensive industries which are as follows:

- **PAT (perform, achieve & trade) scheme:** Improving efficiency in energy intensive sector.
- **Energy Efficiency Financing Platform (EEFP):** provides a platform to interact with financial institutions and project developers for implementation of energy efficiency projects
- **Framework for Energy Efficient Economic Development (FEEED):** focuses on developing appropriate fiscal instruments to promote energy efficiency financing.
- **Market transformation for Energy Efficiency (MTEE):** Accelerating shift toward energy efficient appliances.

- The 2010 amendment to Energy Conservation Act (ECA) provides a legal mandate to PAT which sets mandatory and specific targets for energy efficiency in eight sectors.
- PAT provides the option to trade any additional certified energy savings with other designated consumers to comply with the **Specific Energy Consumption** reduction targets.
- It is a **market-based mechanism** in which sectors are assigned efficiency targets. Industries which over-achieve target get incentives in the form of **energy saving certificates (ESCert)**.
- These certificates are tradable at two energy exchanges viz. **Indian Energy Exchange and Power Exchange India**, where it can be bought by other industries which are unable to achieve their targets.
- **PAT cycle I (2012-13 to 2014-15)**, was applicable on **eight energy intensive sectors viz** Thermal Power plants, Iron & Steel, Cement, Fertilizer, Aluminum, Textile, Pulp & Paper and Chlor-alkali.
- **PAT cycle II (2016-17 to 2018-19):** includes **8 sectors of PAT I and 3 new sectors viz**, railways, discoms and petroleum refineries.
- **PAT cycle III:** Notified from **1st April, 2017** Under it, 116 new units have been included

and given a reduction target of 1.06 million tonnes of oil equivalent.

1.2.2. CARBON SINK

Why in news?

Ministry of Environment and Forest is working on a **landscape-based catchment treatment plan** to achieve its commitment under INDC.

Background

- According to **India State of Forest Report (ISFR) 2015** total forest and tree cover is 24.16 % of the total geographical area, which should be 33% as envisioned under National Forest Policy 1988.
- The carbon stock in India is roughly 7 billion tonnes, equivalent to 25.66 billion tonnes of carbon dioxide.
- Worldwide, 65% of carbon stock is stored in soil and 35% in trees

Catchment treatment plan & its significance

- **Catchment area** (area from which all precipitation flows to a single stream or set of streams) can act as a **natural carbon sinks** that can sequester substantial amounts of atmospheric CO₂ in the form of organic carbon in the soil.
- Improving catchment of water can be done through
 - **Biological Intervention** through afforestation drive and increasing soil porosity through vermiculture etc. as porous soil is able to hold more water than compacted soil.
- Employing **mechanical means** such as check dams, underground reservoirs or cement slabs that can channelise the rainwater further into the soil. Planned management of catchment areas will prevent soil erosion, help recharge groundwater and deter forest fires by retaining moisture in the soil.
- It will minimise human-animal conflict since such a plan will increase availability of water and fodder inside forests and recharge groundwater.

- A **carbon sink** is a natural or artificial reservoir that accumulates and stores some carbon-containing chemical compound for an indefinite period
- **Carbon Sequestration** is the process by which CO₂ is captured from the atmosphere for long-term storage to slow down the accumulation of greenhouse gases. E.g.: Afforestation, Carbon Capture and Storage (CCS) techniques.

As part of its climate change commitments in the aftermath of signing the historic Paris agreement India is now exploring the possibility of **carbon capture utilization storage (CCUS)**.

- **Carbon Capture and Storage (CCS):** It is the process of capturing waste carbon dioxide (CO₂) from large point sources, such as fossil fuel power plants, transporting it to a storage site, and depositing it where it will not enter the atmosphere, normally an underground geological formation.
- **Carbon Capture Utilization Storage (CCUS):** is a process that captures carbon dioxide emissions from sources like coal-fired power plants and either reuses or stores it so it will not enter the atmosphere.
- In **CCS**, **emissions** are forced into underground rocks at great cost and no economic benefit while **CCUS aims** at using CO₂ emissions by exploiting the resource itself and creating new markets around it. CO₂ has commercial and industrial uses, particularly for Enhanced Oil Recovery (EOR) in depleting oil fields.

1.2.3. GREEN CLIMATE FUND

Why in news?

The disagreement between the US and the other 19 countries at the recent G20 summit at Hamburg has put a question mark over the sustainability of the Green Climate Fund (GCF)

G20 Hamburg Climate and Energy Action Plan for Growth

- The G20 (with the exception of the US) decided on clear measures for implementing the Paris Agreement and commencing the global energy transition in line with the goals of the 2030 Agenda for Sustainable Development.

Green climate fund

- It is a global fund created to support the efforts of developing countries to respond to the challenge of climate change.
- It was set up by the 194 countries who are parties to the United Nations Framework Convention on Climate Change (UNFCCC) in 2010, as part of the Convention's financial mechanism. It aims to deliver **equal amounts of funding to mitigation and adaptation**.
- These funds come mainly from developed countries and also from some developing countries, regions, and one city (Paris).

- GCF's activities are aligned with the priorities of developing countries through the principle of country ownership, and national and sub-national organisations **can receive funding directly**.
- Developing countries appoint a National Designated Authority (NDA) that acts as the interface between their government and GCF and must approve all GCF project activities within the country. India's NDA is **NABARD**.
- The Fund pays particular attention to the needs of societies that are highly vulnerable to the effects of climate change, in particular Least Developed Countries (LDCs), Small Island Developing States (SIDS), and African States.

1.2.4. GEO ENGINEERING

Why in news?

A collaborative study by India, China and the U.S. has found that a combination of two geo engineering methods — stratospheric sulphate aerosol increase and cirrus cloud thinning — can be used to reduce global warming and precipitation rates to pre-industrial levels.

What is geo engineering?

Geoengineering (also known as **Climate engineering or climate intervention**) schemes are projects designed to tackle the effects of climate change directly, usually by removing CO₂ from the air or limiting the amount of sunlight reaching the planet's surface.

Methods

Generally, **two categories** of engineering solutions:

- **Greenhouse gas removal through Carbon capture and storage (CCS), enhanced weathering** (It involves a chemical approach to remove carbon dioxide involving land or ocean-based techniques) etc.
- **Reduction of global warming by cutting down the heat absorbed by our planet from the sun through**
 - **Stratospheric aerosol injection which** involves spraying into the stratosphere fine, light-coloured particles designed to reflect back part of the solar radiation (**global dimming**). Sulphur Dioxide gas is used for the process.
 - **Cirrus cloud manipulation:** Here the cirrus clouds are removed or thinned so



that their long-wave trapping capacity is reduced and thus cools the surface.

- **Marine cloud brightening:** The low warm clouds which are highly reflective to sunlight are modified to increase their reflectivity.
- **Space sunshade:** Obstructing sunrays with space-based mirrors
- **Using pale-coloured roofing material** or growing high albedo crops.

1.2.5. COMBATING DESERTIFICATION

Why in news?

- Kubuqi Desert in Ordos, Inner Mongolia, became the **first desert** in the world to achieve large-scale desertification control.
- Jordan launched **Sahara Forest Project (SFP)** to turn the desert land into a flourishing farmland.

Desertification Status in India

- Desertification refers to the land degradation in arid, semi-arid and sub-humid areas resulting from various factors, including climatic variations and human activities.
- The most significant process of desertification/ land degradation in the country is water erosion (10.98% in 2011-13) followed by vegetation degradation (8.91% in 2011- 13) and wind erosion (5.55 % in 2011-13).
- According to the State of India's Environment 2017 by the Centre for Science and Environment report, nearly 30 per cent of India's land is degraded or facing desertification.
- In eight states—Rajasthan, Delhi, Goa, Maharashtra, Jharkhand, Nagaland, Tripura and Himachal Pradesh—around 40 to 70 per cent of land has undergone desertification.

1.2.6. LAND DEGRADATION NEUTRALITY FUND

Why in news?

Land Degradation Neutrality Fund (LDN Fund) was launched at the 13th Conference of the Parties (COP13) to the United Nations Convention to Combat Desertification (UNCCD) in Ordos, China.

More about the news

- LDN fund is a first-of-its-kind investment vehicle leveraging public money to raise private capital for **sustainable land management and landscape restoration** activities worldwide.
- It will be independent from the UN and will be managed by a private sector investment management firm.
- It will invest in bankable projects on land rehabilitation and sustainable land management worldwide, including sustainable agriculture, sustainable livestock management, agro-forestry, sustainable forestry, renewable energy, infrastructure development, and eco-tourism.

United Nations Convention to Combat Desertification (UNCCD)

- Adopted in 1994 and entered into force in 1996, it is the only internationally **legally binding** framework set up to address the problem of desertification
- The Convention addresses specifically the arid, semi-arid and dry sub-humid areas, known as the drylands.
- It recently released the first edition of **Global Land Outlook report**.
- **UNCCD 2018-2030 Strategic Framework** has been launched to improve the condition of affected ecosystems, combat desertification/land degradation and to improve the living conditions of affected populations

2010 to 2020 has been declared as **United Nations Decade for Deserts and the Fight Against Desertification**

1.2.7. GLOBAL SEED VAULT

Why in news?

The Svalbard Global Seed Vault in Norway completed 10 years of its official opening.

About the Svalbard Seed Vault

- It is a state-of-the-art seed protection facility, famously called the 'Doomsday' or the 'Apocalypse' Seed Bank or 'Noah's Ark for seeds'
- It is situated in the remote Arctic Svalbard archipelago.
- It was established in 2008 and serves as the primary backup for the world's other seed banks currently holding nearly one million seed samples from the world's gene banks.



- The seed packages can be accessed only by the depositing authorities with no transfer of ownership.

India's seed vault

- It is situated at Chang La, Ladakh
- Built jointly by the Defence Institute of High Altitude Research (DIHAR) and the National Bureau of Plant Genetic Resources (NBPGR) in 2010 under the aegis of Defence Research and Development Organisation (DRDO), this permafrost seed bank is the second largest in the world.
- Presently, the only other facility in India for long-term storage of seeds is the one set up by Indian Council of Agricultural Research (ICAR) New Delhi.

1.2.8. ARTIFICIAL REEFS TO SAVE SINKING ISLANDS

Why in News?

- Tamil Nadu govt in collaboration with IIT Madras have been restoring **Vaan Island in Gulf of Mannar** by deploying artificial reefs near vulnerable islands.

Gulf of Mannar Biosphere Reserve

- It is the **first marine biosphere reserve in Asia**.
- It lies between the southeastern tip of India and the west coast of Sri Lanka, in the Coromandel Coast region.
- **Fauna:** endangered **Dugong (Sea Cow)**, three species of endangered **sea turtles**, **sea horses**, several species of **dolphins and whales** etc.

More on news

- It is the **first attempt in India** to protect and restore a sinking island.
- The project has been funded by **NAFCC** of the Ministry of Environment, Forests and Climate Change
- Due to **indiscriminate mining of coral**, **destructive fishing practices** and **frequent fires** caused by fisherman in past decades, area of Vaan Island had been reduced.

Prominent Corals in India

- Lakshadweep
- Andaman and Nicobar Islands
- Gulf of Mannar
- Gulf of Kutch
- Netrani Island in Karnataka
- Malwan in Maharashtra

National Adaptation Fund for Climate Change [NAFCC]

- **Aim:** To assist State and Union Territories that are particularly vulnerable to the adverse effects of climate change in meeting the cost of adaptation.
- **NABARD** has been appointed as National Implementing Entity (NIE) responsible for implementation of adaptation projects under the NAFCC.

Man and the Biosphere Programme (MAB)

- Launched in 1971, UNESCO's Man and the Biosphere Programme (MAB) is an Intergovernmental Scientific Programme that aims to establish a scientific basis for the improvement of relationships between people and their environments.
- MAB combines the natural and social sciences, economics and education to improve human livelihoods and the equitable sharing of benefits, and to safeguard natural and managed ecosystems, thus promoting innovative approaches to economic development that are socially and culturally appropriate, and environmentally sustainable.

List of MAB sites in India

- Nilgiri (Tamil Nadu- Karnataka- Kerala).
- Gulf of Mannar
- Sunderban (West Bengal)
- Nanda Devi (Uttarakhand)
- Nokrek (Meghalaya)
- Pachmarhi (Madhya Pradesh)
- Similipal (Odisha)
- Achanakmar- Amarkantak (Madhya Pradesh - Chhattisgarh)
- Great Nicobar (Andaman & Nicobar)
- Agathyamala (Kerala)

1.2.9. MICROBES TO CLEAN CONTAMINATION

Why in News?

- A recent study revealed that microbes are increasingly being used to clean contaminated sites all over world.

Applications of Microbes

- Cleaning up contaminated soils, industrial wastewater, groundwater, mines, and pesticide accumulated sites and fly ash disposal sites.
- Use not limited to bacteria but extended to fungi such as *Aspergillus niger*, *A. terreus*, *Cladosporium oxysporum*.

- Fungi as a microbe may affect the chemical state of metal pollutants, as well as being very important in the degradation of xenobiotic compounds.

Bioremediation techniques:

Oilzapper

- It is essentially a cocktail of five different bacterial strains that are immobilized and mixed with a carrier material (powdered corncob) **developed by TERI**.
- It feeds on hydrocarbon compounds present in crude oil and oily sludge and converts them into harmless CO₂ and water.

Oilivorous-S

- It is a tad different from Oilzapper is an additional bacterial strain that makes the former more effective against sludge and crude oil with high-sulphur content **developed by Indian Oil's research and development wing**.
- Both Oilzapper and Oilivorous-S can be used in situ, thereby eliminating the need to transfer large quantities of contaminated waste from the site, a process that poses more threats to the environment.

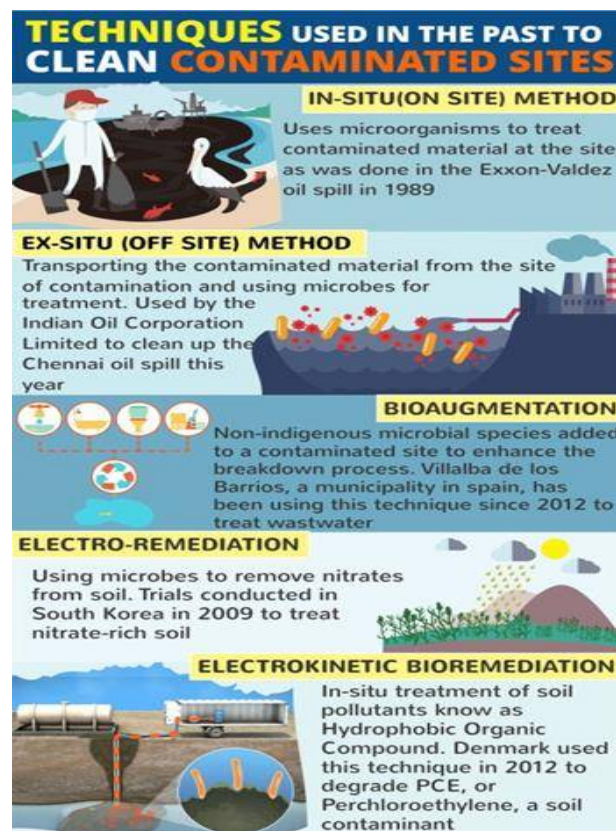
Funaria hygrometrica

- Scientists in Japan identified a moss (Funaria hygrometrica) for phytoremediation-based removal method as it is known to grow well in sites contaminated with metals like copper, zinc, and lead, when in protonema (earliest) stage of development.
- It absorbed lead well at pH values between 3 and 9, which is important because the acidity of metal-polluted water can vary.

Other techniques

Meisenheimer complex

- It is a chemical compound synthesised through mixing two chemicals at room temperature.
- It has been found to be highly effective in removing fluoride and metal ions such as lead, mercury, cadmium, copper, and iron from drinking water as it has negative and positive charged parts.
- A polystyrene sponge when coated with the compound was able to absorb a wide variety of oils and organic solvents from water.



1.3. INTERNATIONAL COOPERATION

1.3.1. BONN CLIMATE MEET

Why in news

- The 23rd meeting of the Conference of the Parties (**COP-23**) of the United Nations Framework Convention on Climate Change (**UNFCCC**) concluded in Bonn, Germany.

About UNFCCC

- In 1992, countries joined the United Nations Framework Convention on Climate Change, as a framework for international cooperation to combat climate change by limiting average global temperature increases.
- It is one of three conventions adopted at the "Rio Earth Summit" in 1992. Its sister Rio Conventions are the **UN Convention on Biological Diversity** and the **Convention to Combat Desertification**.

Highlights

- Adoption of Fiji Momentum for Implementation:** It set the stage for negotiation in 2018. It is divided into three parts which deals with:
 - Completion of the Work Programme under Paris Agreement**

- **Talanoa Dialogue:** Talanoa dialogue is a facilitative dialogue in 2018, to take stock of the collective efforts of Parties in relation to progress towards the long-term goal referred to Paris Agreement and to inform the preparation of nationally determined contributions (NDCs).
- **Pre-2020 implementation and ambition:** Parties agreed that there will be two stock-takes to discuss pre-2020 commitments -- in 2018 and 2019 -- before the Paris Agreement becomes operative in 2020.

- **Gender Action Plan:** The first ever Gender Action Plan to the UNFCCC was adopted at **COP23** (role of gender in climate actions had earlier been included in the **Lima work programme**).
- **Local communities and indigenous people's platform:** It is a new platform to include indigenous people's voices in the implementation of the Paris Agreement. A full operationalization is slated for April-May 2018.
- **Loss and damage:** No financial commitments were agreed upon between the negotiating parties on the issue of loss and damage.

- **Post-2020 Actions** are meant for all countries as per their **nationally determined contributions (NDCs)** under 2015 Paris Agreement.
- **Pre-2020 Actions** refer to existing obligations of small group rich and developed nations to take mitigation actions **under Kyoto Protocol**.
- **Lima Work Programme on Gender (COP-2014):** It aims to advance implementation of gender-responsive climate policies and mandates across all areas of the negotiations.
- **Warsaw International Mechanism for Loss and Damage (COP-19):** It aims to address loss and damage associated with impacts of climate change, including extreme events and slow onset events, in developing countries that are particularly vulnerable to the adverse effects of climate change.

Other Initiative Started during the COP-23

- **Powering Past Coal alliance:** It is initiated by the UK and Canada. 15 countries have joined an alliance to phase out coal-based power by 2030.
- **Below 50 initiative:** It was launched by **World Business Council for Sustainable Development (WBCSD)**. The goal is to create the demand and market for those sustainable fuels that produce at least 50% less CO₂ emissions than conventional fossil fuels.

Convention on Biological Diversity (CBD):

- It is an international legally-binding treaty with three main goals: **conservation of biodiversity; sustainable use of biodiversity; fair and equitable sharing of the benefits arising from the use of genetic resources.**
- The Convention on Biological Diversity covers **biodiversity at all levels: ecosystems, species and genetic resources.**
- **BIOFIN** (launched by UNDP and European Commission and having India as its member) was initiated in response to the urgent global need to divert more finance from all possible sources towards global and national biodiversity goals, as highlighted during the 2010 CBD COP 10 in Nagoya.

Important protocols of the convention:

- The **Nagoya Protocol** on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Use.
 - The **Access and Benefit-sharing Clearing-House** is a key tool for facilitating the implementation of the Nagoya Protocol by enhancing legal certainty, clarity, and transparency on procedures, through the **internationally recognized certificate of compliance (IRCC)**, which serves as evidence that genetic material had been accessed according to procedure and after prior informed consent.
- The **Cartagena Protocol** on Biosafety to the Convention on Biological Diversity

Pursuant to the CBD, India enacted the **Biological Diversity Act** in 2002. The Act is implemented through a three-tiered institutional structure at the national, state and local levels.

- The **National Biodiversity Authority (NBA)** at central level to perform facilitative, regulatory and advisory functions for the government of India on issues of conservation, sustainable use of biological resources and fair and equitable sharing of benefits arising out of the use of biological resources.
- The **State Biodiversity Boards (SBBs)**
- The **institutions of self-governments** are required to set up Biodiversity Management Committees (BMCs) in their respective areas for conservation, sustainable use, documentation of biodiversity and chronicling of knowledge related to biodiversity.

Government of India in collaboration with the Norwegian Government has established a "**Centre for Biodiversity Policy and Law (CEBPOL)**" in the National Biodiversity Authority (NBA), Chennai, to develop professional expertise in biodiversity policies and laws and develop capacity building.



Biodiversity Conservation & Rural Livelihood Improvement Project (BCRLIP) aims at conserving Biodiversity in selected landscapes, including wildlife protected areas/critical conservation areas while improving rural livelihoods through participatory approaches. It is funded by International Development Association (IDA) and a grant from the Global Environment Facility (GEF).

The **Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)** is an independent intergovernmental body, established in 2012. It provides policymakers with objective scientific assessments about the state of knowledge regarding the planet's biodiversity, ecosystems etc.

1.3.2. ECOSYSTEMS SERVICE IMPROVEMENT PROJECT

Why in news?

India recently signed **Global Environment Facility (GEF) Grant** agreement with the World Bank for "Ecosystems Service Improvement Project".

- **Wealth Accounting and the Valuation of Ecosystem Services (WAVES)** is a **World Bank led global partnership** which aims to promote sustainable development by ensuring that natural resources are mainstreamed into development planning and national economic accounts.
- **The BioCarbon Fund Initiative for Sustainable Forest Landscapes (ISFL)** is a multilateral fund, supported by donor governments and managed by the **World Bank**. It promotes reducing greenhouse gas emissions from the land sector, from deforestation and forest degradation in developing countries (REDD+), and from sustainable agriculture, as well as smarter land-use planning, policies and practices.

Ecosystem Services Improvement Project

- **Aim:** To protect, restore and enhance India's forest cover and help in maintaining ecological balance.
- **Objective:** Strengthening the **institutional capacity** of the Departments of Forestry and Community Organisations, to **enhance forest ecosystem services and improve the livelihoods** of forest dependent communities in **Central Indian Highlands**.
- The Project will be implemented in the states of **Chhattisgarh and Madhya Pradesh** for 5 years by **MOEFCC** through the **Indian Council of Forestry Research & Education** under the **National Mission for Green India**.

Green India Mission

- National Mission for a Green India or the Green India Mission (GIM), is one of the eight Missions outlined under India's action plan for addressing the challenge of climate change -the National Action Plan on Climate Change (NAPCC).
- It aims at protecting; restoring and enhancing India's diminishing forest cover and responding to climate change by a combination of adaptation and mitigation measures.
- The mission has the broad objective of both increasing the forest and tree cover by 5 million ha, as well as increasing the quality of the existing forest and tree cover in another 5 million ha of forest/ non-forest lands in 10 years.

Global Environment Facility (GEF)

It was established during the 1992 **Rio Earth Summit** to address the world's most challenging environmental issues.

- Its funds are available to **developing countries and countries with economies in transition** to meet the objectives of the international environmental conventions and agreements.
- Since 1994, **the World Bank** has served as the Trustee of the GEF Trust Fund and provided administrative services.
- It serves as a financial mechanism for **5 major international environmental conventions:** United Nations Framework Convention on Climate Change, United Nations Convention on Biological Diversity, Stockholm Convention on Persistent Organic Pollutants, United Nations Convention to Combat Desertification, Minamata Convention on Mercury.
- **India is the founder member** of GEF. The first GEF Assembly comprising all member countries, taking place once in four years, was hosted by India in 1998.
- The Department of Economic Affairs (DEA), Ministry of Finance is India's GEF **Political Focal Point (PFP)** responsible for policy and governance related matters. Ministry of Environment, Forest and Climate Change (MoEF&CC) is India's GEF **Operational Focal Point (OFP)** responsible for all in-country coordination of GEF activities.

Other initiatives of GEF

- Global Environment Facility in partnership with **Energy Efficiency Services Limited (EESL)**, under Ministry of Power, launched

the project '**Creating and Sustaining Markets for Energy Efficiency**' which further brings together many technical and financing partners including UNEP, Asian Development Bank and *Kreditanstalt für Wiederaufbau* which aims to mitigate 60 million tons of carbon dioxide equivalent.

- **Energy Efficiency Revolving Fund (EERF)** will boost four of EESL's existing technologies. These involve street lighting, domestic lighting, five-star rated ceiling fans and agricultural pumps. It is proposed to be established with the initial corpus of \$13 million from ADB (as part of the GEF Trust Fund)
- GEF also supports the **Global District Energy in Cities Initiative**, which in turn is supporting national and municipal governments in their efforts to develop, retrofit or scale up district energy systems, with backing from international and financial partners and the private sector. In India it has been launched in Bhopal, Pune, Coimbatore, Thane, and Rajkot.

EESL:

- It is 100% government owned, a joint venture of state-owned NTPC Limited, Power Finance Corporation, Rural Electrification Corporation and POWERGRID. Its flagship initiative is Unnat Jyoti by Affordable LEDs for All (UJALA).
- It is also the implementing agency for national mission for enhanced energy efficiency along with Bureau of energy efficiency.

Recently, the first edition of the International Symposium to Promote Innovation & Research in **Energy Efficiency** (INSPIRE 2017) was held in Jaipur, it was organized by **Energy Efficiency Services Limited (EESL)** in partnership with **The World Bank**, and **Alliance for an Energy Efficient Economy (AEEE)**.

1.3.3. UN OCEAN CONFERENCE

Why in News?

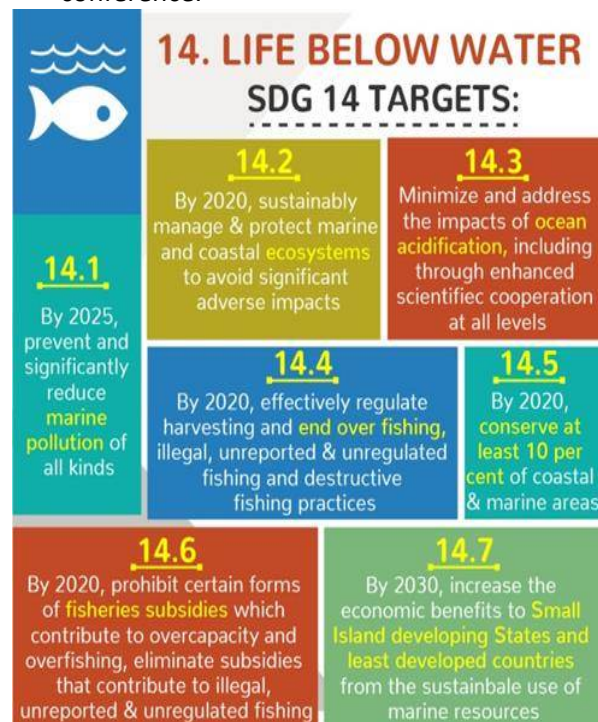
- Recently, **first United Nations Ocean Conference was held in New York**, co-sponsored by Fiji and Sweden under the theme, "**Our oceans, our future: partnering for the implementation of Sustainable Development Goal 14**".

Global Ocean Commission

It is an international initiative that was launched in 2013. It raises awareness and promotes action to address the degradation of the ocean and help restore it to full health and productivity. Its focus is on the high seas, the vast ocean areas **that lie beyond the Exclusive Economic Zones (EEZs)** of individual states.

Outcomes

- It adopted a consensus of a **14-point Call for Action** where the participating Heads of State affirmed their strong commitment to conserve and sustainably use our oceans.
- International Solid Waste Association (a Vienna based NGO) also announced a task force on marine litter in concert with the conference.



1.3.4. WORLD SUSTAINABLE DEVELOPMENT SUMMIT 2018

Why in news?

Recently, World Sustainable Development Summit 2018 was inaugurated by Prime Minister in New Delhi.

About World Sustainable Development Summit (WSDS)

- It is a flagship forum of **The Energy and Resources Institute**, a non-profit, scientific and policy research organization located in Delhi which works in the fields of energy, environment and sustainable development issues since 1974.
- It has been conceptualised as a single platform to accelerate actions towards sustainable development and climate change.
- It seeks to bring together global leader and thinkers on a common platform on various issues of sustainable development such as transition to clean energy, effective waste



management mechanisms, combating air pollution etc.

- It has been built on the success of the **Delhi Sustainable Development Summit (DSDS)** which was the leading forum for discussing sustainable development issues.
- The theme for 2018 event is '**Partnerships for a Resilient Planet**'.

Energy Transitions Commission India (ETC INDIA)

- It was launched by The Energy and Resources Institute (TERI) on the sidelines of the World Sustainable Development Summit (WSDS) 2018.
- It is a unique, high-level, multi-stakeholder platform with experts from diverse fields to suggest pathways for energy and electricity sector transitions in India
- This is inspired by the work of the Global Commission on the Economy and Climate and its flagship project 'the New Climate Economy'.
- It is the first country-specific Commission and thus can act as a model for other emerging economies as they seek to move to renewable energy sources.
- It will also help in a change towards low-carbon energy systems that enable robust economic development and limit the rise in global temperature to well below 2 degrees Celsius.

Recently, India refused adoption of **Bali declaration** adopted at the '**World Parliamentary Forum on Sustainable Development**' due to objections that they were not in line with the agreed global principles of 'sustainable development'.

1.3.5. SUSTAINABLE BIOFUELS

Why in news?

- A two-day international conference on Sustainable Biofuels was hosted by India on behalf of Mission Innovation and Biofuture Platform.

Generations of Biofuels

First Generation Biofuel

- They are **produced directly from food crops**.
- Crops such as wheat & sugar are the most widely used feedstock

Second Generation Biofuel

- They are produced from **marginal croplands unsuitable for food production or non-food crops** such as wood, organic waste, food crop waste and specific biomass crops. For example- Jatropha.
- Thus, it overcomes over food vs fuel debate in

first generation biofuel.

- It is also aimed at being cost competitive in relation to existing fossil fuels and increasing Net energy gains.

Third Generation Biofuels

- It is based on improvements on the production of biomass by taking advantage of **specialty engineered energy crops** such as algae as its energy source.
- The algae are cultured to act as a low-cost, high-energy and entirely renewable feedstock.
- Algae will have the potential to produce more energy per acre than conventional crops.

Fourth Generation Biofuels

- Fourth Generation Bio-fuels are aimed at producing sustainable energy and also capturing and storing carbon dioxide.
- This process differs from second and third generation production as at all stages of production the carbon dioxide is captured which can be then geo-sequestered.
- This carbon capture makes fourth generation biofuel production carbon negative rather than simply carbon neutral, as it is 'locks' away more carbon than it produces.

Recently the country's first second-generation (2G) Ethanol plant has been setup in Uttarakhand.

Key facts

- The conference aims at providing platform for exchanging experiences and challenges related to development and scaling of advanced biofuels.
- Importance of sustainable biofuels led to establishment of **Sustainable Biofuel Innovation Challenge (SBIC)** as one of the seven challenges under **Mission Innovation (MI)**. Other six challenges are:
 - Smart Grids Innovation Challenge
 - Off-Grid Access to Electricity Innovation Challenge
 - Carbon Capture Innovation Challenge
 - Converting Sunlight Innovation Challenge
 - Clean Energy Materials Innovation Challenge
- India will be leading the Smart Grids innovation challenge and co-lead the sustainable biofuels innovation challenge.
- This challenge aims to accelerate research, development and deployment of low cost, high GHG impacting advanced biofuels.

Mission Innovation (MI)

- It is a global initiative of 22 countries and the European Union to dramatically accelerate global clean energy innovation.



- It seeks to double investments in clean energy innovation over **five years**.
- Department of Biotechnology (DBT) is nodal agency of this mission in India

Biofuture Platform

- It is a 20-country effort to promote an advanced low carbon bio economy that is sustainable, innovative and scalable.
- It has been proposed by Brazil which is serving as the interim secretariat of this platform.

National Policy on Bio-fuels features:

- Bio-diesel production will be taken up from non-edible oil seeds in waste /degraded / marginal lands. Currently, bio-fuels are being generated mostly from molasses which is a by-product of sugar production.
- An **indicative target of 20% blending of bio-fuels**, both for bio-diesel and bio-ethanol, by 2017 had been proposed. Currently, according to the government norms, **10 per cent of ethanol** extracted from sugarcane can be mixed with petrol.
- Minimum Support Price (MSP) for non-edible oil seeds would be announced with periodic revision to provide fair price to the growers.
- Minimum Purchase Price (MPP) for purchase of bio-ethanol and bio-diesel would be announced with periodic revision.
- Major thrust will be given to research, development and demonstration with focus on plantations, processing and production of bio-fuels, including Second Generation Bio-fuels.
- Financial incentives, including subsidies and grants, may be considered for second generation bio-fuels. If it becomes necessary, a National Bio-fuel Fund could be considered.
- **A National Biofuel Coordination Committee, headed by the Prime Minister**, will be set up to provide policy guidance and coordination.
- A Biofuel Steering Committee, chaired by Cabinet Secretary, will be set up to oversee implementation of the Policy.
- The Ministry of New & Renewable Energy has been designated as the coordinating Ministry for biofuel development and utilization



2. POLLUTION

2.1. AIR POLLUTION

2.1.1. DELHI AIR POLLUTION

Why in news?

Recently, NCR experienced "severe" levels of pollution on Air Quality Index.

More on news

- PM2.5 concentrations in New Delhi reached more than 1,200 micrograms per cubic meter, 48 times the guideline value established by the World Health Organization

Reasons behind Delhi's air pollution

- During winter season in Delhi, there are two winds — one carrying pollutants from stubble burning in Punjab and the other bringing in moisture from Uttar Pradesh — that collide and get locked, which leads to the formation of smog.
- In Delhi, the ground-level ozone and PM 2.5 play the most significant role in formation of smog.
- According to a study by the **System of Air Quality and Weather Forecasting and Research** (under the Ministry of Earth Sciences) and **India Meteorological Department** (IMD) "multi-day dust storm" in Iraq, Kuwait and Saudi Arabia was the main cause of Delhi's smog between November 6 and 14.
- Large scale construction activities in Delhi-NCR** are major source of dust particle in air.
- Other major reason includes:** Vehicular emission, Industrial pollution, garbage dumps etc.

Recently a report on pollution has been released by The **Lancet Commission on Pollution and Health**. **Pollution was responsible for 9 million deaths in 2015 worldwide.**

- Of the 2.51 million deaths in India, 1.81 were related to air pollution, 0.64 million to water pollution, 0.17 million to occupational exposure and 95,000 linked to lead pollution.
- Half of the top 20 polluted cities in the world are in India.

Smog: There are two types of smog:

(a) **Classical smog** occurs in cool humid climate. It is a mixture of smoke, fog and sulphur dioxide. Chemically it is a reducing mixture and so it is also called as reducing smog.

(b) **Photochemical smog** occurs in warm, dry and sunny climate. The main components of the photochemical smog result from the action of sunlight on unsaturated hydrocarbons and nitrogen oxides produced by automobiles and factories. Photochemical smog has high concentration of oxidising agents and is, therefore, called as oxidising smog.

Formation of photochemical smog: When unburnt hydrocarbons and nitric oxide (NO) are built up to sufficiently high levels, a chain reaction occurs from their interaction with sunlight in which NO is converted into nitrogen dioxide (NO₂) and Ozone which leads to production of chemicals such as formaldehyde, acrolein and peroxyacetyl nitrate (PAN).

- It causes serious health problems. Both ozone and PAN act as powerful eye irritants. Ozone and nitric oxide irritate the nose and throat and their high concentration causes headache, chest pain, dryness of the throat, cough and difficulty in breathing.
- It leads to cracking of rubber and extensive damage to plant life. It also causes corrosion of metals, stones, building materials, rubber and painted surface

Steps Taken

- Ministry of Environment's orders issued in 2015 under the Air (Prevention and Control of Pollution) Act, 1981 to comprehensively green Delhi's road margins and open spaces
- Advancing Bharat Stage-VI norms to April 2018 from April 2020.
- Closure of brick kilns and an increase in parking fees to encourage the use of public transport.
- Nation Green Tribunal ordered construction to stop in the capital for a few days earlier this month.
- Ban on petcoke & furnace oil in and around NCR, Odd and even policy, Ban on sale of fire crackers etc.
- Delhi government had submitted a detailed action plan to the National Green Tribunal on combating air pollution. The measures listed would be implemented simultaneously with the **Graded Response Action Plan (GRAP)**.
- The Central government has also released a Draft action plan for the same.
- The NGT has also issued its own action plan.
- The Environment Ministry has also launched a Regional Project to Tackle Stubble Burning.



- The Supreme Court had ordered an Environment Compensation Charge (ECC) of 1% for the registration of diesel cars above 2000 cc in Delhi. The SC has named it as a charge and not a tax or cess, this is because any tax or surcharge or cess should have the authentication of the legislature. But the ECC doesn't fulfill such a qualification.
 - Tax revenue will go to the Central Pollution Control Board and the Board has to open a separate account for the purpose.
- CPCB announced that it may use LIDAR devices to **vertically monitor** the air quality of Delhi-NCR.
- The Ministry of Environment, Forests and Climate Change has proposed an amendment to the Environment Protection Act, 1986 to impose fines of up to Rs 1 crore on polluters.

About LIDAR (Light Detection and Ranging)

- LIDAR is a monitoring system for mapping and modelling in **micro-topography, forestry, agriculture, meteorology** and **environmental pollution**.
- It is an **optical analog** of **radar** that **uses light** in the form of a pulsed laser to carry out remote sensing.
- This technology generates **precise, three-dimensional information** about the object under study.
- A LIDAR instrument principally **consists** of a laser, a scanner, and a specialized GPS receiver.
- LIDAR projects laser beams towards the sky to study the composition of pollutants present in the upper layers.

2.1.2. BAN ON POLLUTING FUELS

Why in News

Recently, Supreme Court banned the use of furnace oil and pet-coke in Haryana, Rajasthan and Uttar Pradesh. Later, however, it eased its ban on use of petcoke for cement manufacturing, lime industries and on furnace oil for power generation.

More on news

- Pet coke and other polluting fuels such as furnace oil are widely used by cement factories, dyeing units, paper mills, brick kilns and ceramics businesses.
- India is becoming a dumping ground of pet-coke from the US, which has banned its internal use because of pollution.

Reason for increased use of Pet-coke and furnace oil

- Per-unit delivered energy for petcoke is **much cheaper compared to coal** making it attractive for buyers.
- **Favourable tax regime:** Though both these fuels are taxed at 18% under GST but the industries, which use these fuels for manufacturing, get entire tax on the fuels credited back. On the other hand, on natural gas, which is not included in GST, the VAT is as high as 26 per cent in certain states.
- **Clean energy cess** of Rs. 400 per tonne levied on coal, further promotes shift to pet-coke.
- **Zero Ash Content.**

About pet coke

- Petroleum coke or pet coke, is a solid carbon rich (90% carbon and 3% to 6% sulfur) material derived from oil refining.
- It is categorized as a "bottom of the barrel" fuel.
- It is a dirtier alternative to coal and emits 11% more greenhouse gases than coal and has higher sulphur than other fossil fuels.
- India is the world's biggest consumer of petroleum coke
- It is an approved fuel in many states such as Andhra Pradesh, Telangana, Gujarat and Karnataka.

About Furnace oil

- It is a dark viscous residual fuel obtained by blending mainly heavier components from crude distillation unit, short residue and clarified oil from catalytic cracker unit.
- It is one of the cheapest fuels available and used to generate power in industries to run boilers, turbines etc.

The Air (Prevention and Control of Pollution) Act, 1981

- According to it, governments may prohibit the use of fuel, which is likely to cause air pollution, in air pollution control areas.
- Act also give authority to state board to declare any fuel as '**approved fuel**'.

2.1.3. BAN ON THE USE OF CHEMICALS IN FIRECRACKERS

Why in News?

Recently, Supreme Court **imposed a ban on the use of antimony, lithium, mercury, arsenic and lead** in the manufacture of firecrackers to prevent air pollution

Highlight

- SC entrusted the **Petroleum and Explosive Safety Organisation (PESO)** with the responsibility of ensuring compliance



- At present, there are **no standards on air pollution** caused by the bursting of firecrackers.
- SC asked the CPCB to clarify **on the use of strontium**, another chemical branded toxic by the pollution body, in firecrackers.
- **Antimony Sulphides** are also used in the production of heads of safety matches, though in its elemental form it is not dangerous to humans, inhalation of antimony trioxide is considered harmful and carcinogenic.
- Certain compounds of Arsenic are highly explosive and a health hazard.
- **Lithium** is a highly volatile element, which is highly flammable and explosive when exposed to air (**Health effects of Lead and Mercury have been covered under e-waste.**)

Petroleum and Explosives Safety Organisation (PESO)

- It is the apex department to control and administer manufacture, storage, transport and handling of explosives, petroleum, compressed gases and other hazardous substances in India.
- It functions under the **Department of Industrial Policy and Promotion (DIPP)**, Ministry of Commerce and Industry. HQ at Nagpur
- It administers the responsibilities delegated under the **Explosives Act 1884 and Petroleum Act 1934.**
- **Procurement of raw materials for fireworks does not come under the purview of the Explosives Act.** The PESO has been testing samples of crackers only for adherence to the sound limit of 125 decibels at a distance of four metres.

2.1.4. SULPHUR DIOXIDE EMISSIONS IN INDIA

Why in news?

According to a recent study, India's sulphur dioxide (SO₂) emission is among highest in world.

Highlights

- **Increasing proportion of SO₂:** Over the last 10 years, India's SO₂ emissions have spiked by 50% and it could become the world's largest emitter of the toxic air pollutant.
- **Major reason:** India has been releasing the harmful pollutant by burning coal – which

contains about 3% of Sulphur – to generate electricity. The country produces more than 70% of its electricity from coal.

About Sulphur Dioxide (SO₂)

- It is a colorless reactive gaseous air pollutant with a pungent odor.
- It impacts visibility and causes haze.
- **Natural Sources:** Sulphur dioxide is naturally produced by volcanoes.
- **Man-made Sources:** Burning fuels – coal, oil and gases containing sulphur – and by smelting metals like copper, zinc, lead & nickel and motor vehicle emission. Other gases emitted by thermal power plants are Nitrogen oxides, mercury carbon dioxide, water vapours and fly ash.

Impact

- **Acid Rain:** When sulfur dioxide combines with water and air, it forms sulfuric acid, which is the main component of acid rain. It can cause **deforestation, acidify waterways** to the detriment of aquatic life, **corrode building materials& paints** etc.
- **On health:** It affects human respiratory system and makes breathing difficult. Children, elderly, and those who suffer from asthma are particularly sensitive to effects of SO₂.
- **Other health effects** include irritation in eyes, coughing, mucus secretion and chronic bronchitis.

Government Action on SO₂

- It is one of the pollutants being measured under **Air Quality Index.**
- Increasing **cess on coal** production to Rs 400 per tonnes.
- Implementation of **Bharat Stage Norms:** While BS IV-compliant fuel currently in use has 50 parts per million (ppm) sulphur, BS VI stipulates a low 10 ppm. The switch to BS-VI norms will also reduce concentration of carbon monoxide, unburnt hydrocarbons, nitrous oxide and particulate matter from emissions.



- **Emission norms for Thermal power plant (2015):** It direct them to reduce emission of PM 10, SO₂ and oxide of nitrogen and mercury. along with water consumption norms for thermal power stations.
- Countrywide emission-monitoring stations, switching to other sources of energy and installation of pollution abatement equipment in thermal power plants, such as **flue-gas particulate collectors, flue-gas desulphurization (FGD) system and nitrogen oxide control devices.**

2.1.5. EXCESSIVE NITROGEN IN ATMOSPHERE

Why in news?

- Indian Nitrogen Assessment report was released by an NGO Society for Conservation of Nature (SCN).

Importance of Nitrogen

- Nitrogen is a naturally occurring element that is essential for growth and reproduction in both plants and animals. It comprises about 78% of the Earth's atmosphere.

Fact about Nitrogen pollution in India

- **Agriculture is the main source** of nitrogen pollution in India followed by Sewage and organic solid wastes.
- Ammonia concentration in the atmosphere over India is the highest in the world due to cattle population and excessive fertilizer use.
- Only 33% of the nitrogen applied to rice and wheat through fertilizers is taken up by the plants in the form of nitrates.

Impact of nitrogen pollution

- **Reducing Food productivity**
- **Polluting Groundwater**
- Nitrous oxide (N₂O) is 300 times **more potent as a greenhouse gas** as opposed to CO₂.
- **Health impact:** Blue Baby Syndrome, reduced functioning of the thyroid gland, Vitamin A shortages etc.
- **Causes acid rain**
- **Eutrophication:** Due to large amounts of fertilizers run-off, there is formation of a **dead zone** (areas in the ocean of such low oxygen concentration that animal life suffocates and dies).
- **Ozone depletion:** Nitrous oxide (N₂O/ laughing gas) is considered as a dominant ozone-depleting substance emitted by humans.
- **Smog Formation**

Steps taken to control Nitrogen pollution

- **Mandatory neem-coated urea production:** Neem-coated urea releases nitrogen at a slower pace giving plants time to absorb it, hence leading to an optimal usage
- **Soil Health Card:** It provides information to farmers on nutrient status of their soil along with recommendations on appropriate dosage of nutrients for improving soil health and its fertility. It has led to decrease in consumption of Nitrogen in agriculture.
- **The Nutrient Based Subsidy (NBS) Policy** is being implemented by the Department of Fertilizers and under this policy, a fixed amount of subsidy is provided on subsidized Phosphatic & Potassic (P&K) fertilizers on annual basis for each nutrient i.e., Nitrogen (N), Phosphorous (P), Potash (K) and Sulphur (S) depending on its Nutrient Content. **Urea** is the only fertilizer whose price is controlled by the government.

International Initiatives

- **Gothenburg Protocol:** It aims to Abate Acidification, Eutrophication and Ground-level Ozone and is a part of is part of the **Convention on Long-Range Transboundary Air Pollution.**
 - **Objective:** To control and reduce emissions of sulphur dioxide (SO₂), nitrogen oxides (NO_x), ammonia (NH₃), volatile organic compounds (VOCs), and Particulate Matter (PM) that are caused by human activities.
- **Kyoto Protocol:** It aims to reduce the emissions of the Green House Gases such as Methane (CH₄), Nitrous oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), Sulphur hexafluoride (SF₆) and carbon dioxide (CO₂).
- **International Nitrogen Initiative (INI)** - It is an international program, set up in 2003 under sponsorship of the Scientific Committee on Problems of the Environment (SCOPE) and from the International Geosphere-Biosphere Program (IGBP) to optimize nitrogen's beneficial role in sustainable food production.



2.1.6. AEROSOLS CAUSES SHRINKING OF INDIA'S MONSOON

Why in News?

- Climatologist from Indian Institute of Tropical Meteorology contended that aerosols (particulate matter) is the major cause of weakening of the monsoon.

More on news

- Aerosols are suspension of particles in the atmosphere via both human-made and natural sources. E.g. Volcanic and desert dust, sulphate from coal.
- Upgraded study model suggests that that aerosols may be a far more important factor than GHGs on impact on monsoon.
- They impact cloud formations because water condenses on them.
- They offset warming from greenhouse gases because they send some of the sun's radiant energy back to space exerting a cooling influence on Earth's climate.
- A good monsoon, which is produced by the difference in temperature between land and sea, is thus weakened by aerosol accumulation.

2.1.7. URBAN HEAT ISLAND

Why in news?

- Recently a report by the American Geophysical Union says "fog holes" are observed in urban areas globally -- especially over Delhi due to urban heat island.

The major factors responsible for UHI:

- **Direct pollution:** From various sources of heat in city from fires, industry, home, agriculture burning in surround areas.
- **Absorption of heat:** Heat conserving properties of the bricks, fabric and concrete materials of the city
- **Urban geometry:** The height and spacing of buildings affects the amount of radiation received and emitted by urban infrastructure.
- **Blanketing effect** by atmospheric pollution on outgoing radiation
- **Reduced vegetation** in urban region which reduces the natural cooling effect from shade and evapotranspiration.

Effects of UHI on urban areas

- **Increase in demand for Energy:** Increased temperatures during summer in cities amplify energy demand for air conditioning contributing to higher electricity bills.
- **Increase in greenhouse gas emissions and air pollution:** Increased energy demand increases the production of energy from fossils fuels and thermal power plants leading to air pollution in surrounding areas.
- **Discomfort and danger to human health:** Health is impacted due to general exhaustion, heat strokes, heat cramps, headaches and respiratory problems.
- **Secondary impacts on weather and climate:** This includes changes of local wind patterns, formation of fog and clouds, precipitation rates and humidity. The unusual heat can lead to intense vertical movement of air leading to thunderstorms and precipitation
- **Impact on Plants, Forest and animals:** High temperatures may create disturbances on biological life of plants

How to counter UHI effect from the region?

- **Use of light-colored concrete and white roofs:** to increase the albedo.
- **Use of green roofs:** The roof of a building is partially or completely covered with vegetation which absorbs rainwater; provides insulation helping to lower urban air temperatures.
- **Construction of green buildings:** These should be constructed in a manner that is resource-efficient, environmentally sustainable.
- **Planting trees in cities:** Trees provide shade, absorb carbon dioxide, release oxygen and fresh air, and provide a cooling effect.
- **Improvement in technologies and infrastructure:** By promoting fuel efficiency to reduce the emission. Adhering to higher standards of emission norms like Bharat Stage VI.

2.1.8. DUST MITIGATION PLAN

Why in news

Recently, centre has notified dust mitigation norms to arrest dust pollution.

Need of these rules

- IIT Kanpur study on Delhi's air pollution in 2015 had identified road dust as one of the



biggest source of suspended particulate matter in the city.

More about news

- Rules are notified under the **Environment (Protection) Act, 1986**, which empowers Environment Ministry to issue notices against local authorities and state agencies for non-implementation of those actions
- These standards were developed by the Central Pollution Control Board as part of the National Ambient Air Quality Standards (NAAQS)
- The rules are applicable on cities which exceed the annual prescribed limit of 40 µg/m³ for PM_{2.5} and 60 µg/m³ for PM₁₀
- It also **empowers CPCB** to fine companies and agencies for not complying with norms.

Highlight of rules

- **Mandatory dust mitigation plan** for all building or infrastructure projects seeking environment clearance.
- **No soil excavation** without adequate dust mitigation measures in place.
- No loose soil, sand, construction waste could be left **uncovered**.
- **Mandatory water sprinkling** system
- **No uncovered vehicles** carrying construction material and waste would be permitted.
- Roads leading to, or at construction sites must be **paved and blacktopped** (i.e. metallic roads)
- **Wind-breaker** of appropriate height i.e. 1/3rd of the building height and maximum up to 10 meters shall be provided;

The **Central Pollution Control Board (CPCB)** is a **statutory organization**, constituted under the Water (Prevention and Control of Pollution) Act, 1974. Further, CPCB was entrusted with the powers and functions under the Air (Prevention and Control of Pollution) Act, 1981.

National Air Quality Index

- It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour.
- There are six AQI categories, namely Good, Satisfactory, Moderately polluted, Poor, Very Poor, and Severe. AQ sub-index and health breakpoints are evolved for eight pollutants (PM₁₀, PM_{2.5}, NO₂, SO₂, CO, O₃, NH₃, and Pb) for which short-term (upto 24-hours) National Ambient Air Quality Standards are prescribed.
- SAMEER app has been developed to display AQI at a city and receive complaints.

Pollutants covered under NAAQS

Sulphur dioxide, Nitrogen dioxide, lead, Ozone, PM₁₀, PM_{2.5}, carbon monoxide, Ammonia, Arsenic, Benzene, Benzopyrene, Nickel

Comprehensive Environmental Pollution Index (CEPI)

- Measured by Central Pollution Control Board for Monitoring Polluted Industrial Areas (PIAs)
- Four Indices for CEPI
 1. Scale of Industrial Activity Observed Value of Pollution in air
 2. Scale of exceedance of Environment quality.
 3. Health related statistics.
 4. Compliance status of Industry
- It is a rational number between 0 and 100
- CEPI score of 70 or above is considered as critically polluted cluster tag.

2.1.9. ASH TRACK

Why in news?

- The government of India has launched a web-based monitoring system and fly ash mobile application named ASH TRACK.

About the Platforms

- These platforms will enable better management of the ash produced by thermal power plants by providing an interface between fly ash producers (Thermal Power Plants) and potential ash users such as – road contractors, cement plants etc.
- The ASH TRACK App would be managing 200 million tonnes of fly ash by tracking coal-based power plants situated within 100 km and 300 km from given location and availability of fly ash, along with prospective users within the same radius.
- The App gives plant-wise, utility-wise and State-wise ash utilization status in the country.
- The thermal plants are required to regularly update fly ash generation, utilisation and stock on the web portal and the app.

Facts on Fly Ash

- It is a fine powder, which is the **by-product of burning coal** in thermal power plants.
- It is a proven resource material for many applications of construction industries and currently is being utilized in **manufacturing of portland cement, bricks/blocks/tiles manufacturing, road embankment construction and low-lying area development, etc.**
- It can be advantageously used for reclamation of land and also in **agriculture** as



an agent for acidic soils, as soil conditioner — improving upon some important physico-chemical properties of the soil such as hydraulic conductivity, bulk density, porosity, water holding capacity, etc.

- Around 176 million tonnes of fly ash is generated in India every year and at present only 63 percent of it is being utilized.
- India is still not able to match the potential of its fly ash use. As per a recent study by CSE only 50- 60% of the fly ash generated is being utilized. Following steps have been taken to utilize its potential:
 - 2009 notification of MoEF provided **guidelines on ash utilization** advocating its usage within 100 km radius of thermal power plants.
 - New and innovative uses are also taking place- especially initiated by power companies like NTPC in collaboration with Institutes like IIT-Delhi and IIT-Kanpur e.g. Manufacture of pre-stressed railway concrete sleepers
 - Maharashtra became the first state in the country to adopt the Fly Ash Utilization Policy.
 - Recently Maharashtra government has also decided to come up with an export policy for fly ash in the light of demand from places like Singapore and Dubai.

2.1.10. OZONE PROTECTION

Why in news?

- India is phasing out production and consumption of Hydrofluorocarbons (HCFC) as per Montreal Protocol Schedule.
- Under the Protocol, India has already successfully phased out the earlier generation of refrigerants, Chlorofluorocarbons (CFCs) and Halon.
- The year 2017 marks the 30th Anniversary of the Montreal Protocol on Substances that Deplete the Ozone Layer.

More about the news

- India's current HCFC Phase out Management Plan stage II would result in phasing out of 60 per cent of the HCFCs by January 1, 2023 against the target of 35 per cent phase out in 2020 and 65 pc phase-out in 2025.
- A multilateral fund, set up under the Protocol, has also approved USD 44.1 million for India's HPMP-II and the money will be

used to help industries to switch over to alternatives and train manpower.

- Montreal Protocol is an international treaty under the **Vienna Convention for the Protection of the Ozone Layer**. The treaty is the only treaty with **universal ratification by all UN members**.
- HCFCs are currently used in various sectors including refrigeration, air-conditioning and foam manufacturing.
- After phasing out HCFC, the country will have to move to a next stage where it will work on to phase out HFC as per Kigali agreement 2016 under which India will have to cut use of HFC by 85% by 2047 over the 2024-2026 level (baseline).

Hydrochlorofluorocarbons (HCFCs) are a large group of compounds, whose structure is very close to that of **Chlorofluorocarbons** (CFCs). Under normal conditions, HCFCs are gases or liquids which evaporate easily. They are generally fairly stable and unreactive. HCFCs are also part of a group of chemicals known as the volatile organic compounds (VOCs).

As VOCs, they may be involved in reactions to produce ozone, which can cause damage to plants and materials **on a local scale**. At a global level however, releases of HCFCs can destroy the ozone layer. HCFCs also contribute to Global Warming. Although the amounts emitted are relatively small, they have a powerful warming effect (a very high "Global Warming Potential").

Hydrofluorocarbons or 'HFCs' have been increasingly used as an alternative to CFCs in refrigeration systems. Unfortunately, they can also be powerful greenhouse gases with long atmospheric lifetimes.

Kigali Agreement

- It aims to reduce the emissions of hydro fluorocarbons (HFCs) with the potential for reduction up to 0.5 degrees Celsius of global warming by year 2100.
- The Kigali Amendment amends the 1987 Montreal Protocol to **now include gases responsible for global warming and will be binding on countries from 2019**.
- It has provisions for penalties for non-compliance as it is considered absolutely vital for reaching the Paris Agreement target of keeping global temperature rise to below 2-degree Celsius compared to pre-industrial times.
- Under it, developed countries will also provide enhanced funding support estimated at billions of dollars globally.



- All signatory countries have been divided into three groups with different timelines to go about reductions of HFCs; **First group:** It includes richest countries like US which will freeze production and consumption of HFCs by 2018 and reduce them to 15% of 2012 levels by 2036. **Second group:** It includes countries like China, Brazil and all of Africa etc. They will freeze HFC use by 2024 and cut it to 20% of 2021 levels by 2045. **Third group:** It includes countries India, Pakistan, Pakistan, Iran, Saudi Arabia etc. They will be freezing HFC use by 2028 and reducing it to about 15% of 2025 levels by 2047.

Greenhouse gas	Global Warming Potential, 100-year time horizon	Atmospheric Lifetime (years)
Carbon Dioxide	1	100*
Methane	25	12
Nitrous Oxide	298	114
Chlorofluorocarbon-12 (CFC-12)	10,900	100
Hydrofluorocarbon-23 (HFC-23)	14,800	270
Sulfur Hexafluoride	22,800	3,200
Nitrogen Trifluoride	17,200	740

2.1.11. BLACK CARBON IN STRATOSPHERE

Why in news?

- According to a group of scientists, **airplanes may be ejecting** significant amounts of black carbon (BC) and this may be **depleting the ozone layer**.

What is Black Carbon (BC)?

- It is produced **both naturally and by human activities** as a result of the **incomplete combustion** of fossil fuels, biofuels, and biomass.
- BC particles strongly absorb sunlight and give soot its black color.
- It is emitted directly into the atmosphere in the form of fine particles (PM_{2.5}).
- It is known to be **one-fourth as potent** as carbon dioxide in whetting global warming.

Adverse effects of black carbon

- Ozone depleting Agent
- Potential to upset monsoon
- Enhance melting of glaciers
- Health hazard

2.2. LIGHT POLLUTION

Why in News?

As per a report, light pollution is increasing as the newly lit areas are growing at a rate of 2.2% annually.

About Light Pollution

- Light pollution is an unwanted consequence of **excessive or misdirected artificial lighting** and includes such **effects** as sky glow, light trespass and glare.
- Global push towards energy and cost-efficient light sources, such as LEDs, has directly contributed to an increase in light pollution.

Sky glow is a brightening of the sky caused by both natural and human-made factors. The key factor of sky glow that contributes to light pollution is outdoor lighting.

Light pollution **poses a significant health risk to humanity and biodiversity** in following ways:

- Blue light from LED lighting affects **sleep-inducing hormone melatonin** thus **disrupting body's inner clocks**.
- Artificial lighting near waterways draws insects up from the water surface and toward the lighting source, **disrupting food chains** and **weakening the local ecosystem**.
- They **reduce the pollinating activity of nocturnal insects** and thus are threat to **crop pollination**.
- It can cause **migrating birds** to be **thrown off course** which **navigate partly with the help of light from the moon and the stars**.
- It causes **decline in sea turtle populations**, as hatchlings are lured away from the water and toward the light, where they are snapped up by predators.
- It makes stargazing difficult and can also cause **trees to bloom out of season**.

2.3. SOLID WASTE

2.3.1. GUIDELINE FOR ODOUR POLLUTION

Why in news?

Recently, recognizing the urgent need for abatement of odour from **municipal solid waste (MSW)** disposal facilities in urban India, the **Central Pollution Control Board (CPCB)** has proposed guidelines to tackle it.

Background

- **Centre's Solid Waste Management Rules, 2016**, identified odour as a **public nuisance**.
- India has regulatory frameworks to control air pollutants but, "no regulation has been made for abatement and control of odour which is now becoming **cause of major problem** with increasing urbanization and industrialization.

Highlight of the Guidelines

- **Green Belt Around Landfill Sites**
- **Tapping LFG (Landfill Gases) Efficiently:** The composition of landfill gas is approximately 50 percent methane and 50 percent carbon dioxide with trace amounts (<1 percent) of nitrogen, oxygen, hydrogen sulphide, hydrogen, and non-methane organic compounds (NMOs).
- **Integrated with The Urban Development Planning**

Related news

- Alappuzha, Kerala famous for its canals, is among the five cities recognised by the United Nations Environment Programme (UNEP) as global success stories in solving the problem of solid waste.

Solid Waste Management Rules, 2016

- Rules have mandated the **source segregation** of waste in order to channelise the waste to wealth by recovery, reuse and recycle.
- **Waste generator will have the responsibility** of segregating the waste into wet, dry and Hazardous. They will have to pay user fine to the waste collector and spot fine for littering around; the amount will be decided by the local body.
- Waste processing facilities will have to be set up by all local bodies having 1 million or more population within two years.
- Rules have mentioned about the integration of rag pickers, waste pickers and kabadiwalas from the **informal sector to the formal sector** by the state government.
- Developers of Special Economic Zone, industrial estate, industrial park to earmark at least 5 per cent of the total area of the plot for recovery and recycling facility.

2.3.2. STAR RATING PROTOCOL FOR GARBAGE FREE CITIES

Why in news?

Ministry of Housing and Urban Affairs recently launched the Star Rating Protocol for garbage free cities under Swachh Bharat Mission (Urban).

About the news

- It aims to enthuse the cities with a spirit of healthy competition to improve their overall cleanliness.
- It is different from the Swachh Survekshan ranking survey as it will allow multiple cities to be awarded the same star rating.
- A city should be ODF (Open Defecation Free) before it could be given rating of 3 star or above. While cities may self-declare themselves as 1-star, 2-star or 4-star, MoHUA will carry out an additional verification through an independent third party to certify cities as 3-star, 5-star or 7-star.
- The major focus in the ratings will be on waste storage and litter bin.
- An online database was also launched in order to capture the progress of states and cities on their SBM components, thereby **enhancing the robustness and transparency of Mission monitoring**.

Swachh Bharat Mission (Urban) is an initiative under the Ministry of Housing and Urban Affairs with the following objectives:

- Eliminate open defecation,
- Conversion of insanitary toilets to pour flush toilets,
- Eradication of manual scavenging,
- 100% collection and scientific processing/disposal reuse/recycle of Municipal Solid Waste,
- To bring about a behavioral change in people regarding healthy sanitation practices,
- Generate awareness among the citizens about sanitation and its linkages with public health.
- Strengthening of urban local bodies to design, execute and operate systems,
- To create enabling environment for private sector participation in Capital Expenditure and Operation & Maintenance (O&M) costs.

The Mission has following components:

- Construction of Household Toilets,
- Community and Public Toilets,
- Solid Waste Management,
- Information, Education & Communication (IEC) and Public Awareness,
- Capacity Building and Administrative & Office Expenses (A&OE).

Swachh Survekshan

- It aims to rank all the 4,041 cities and towns of the country based on infrastructure development

for improved sanitation services and their sustainability, outcomes, citizen connect and visible impact on ground.

- It is conducted by Quality Council of India.

Quality council of India

- It was set up jointly by the Government of India and the Indian Industry represented by the three premier industry associations i.e. Associated Chambers of Commerce and Industry of India (ASSOCHAM), Confederation of Indian Industry (CII) and Federation of Indian Chambers of Commerce and Industry (FICCI).
- Chairman of QCI is appointed by the Prime Minister on recommendation of the industry to the government.
- Recently, third party survey on station cleanliness was carried out by it as part of 'Swachh Rail' campaign in which Visakhapatnam railway station was ranked the cleanest.

2.4. PLASTIC POLLUTION

Why in News?

- India will host this year's **World Environment Day, an initiative of UN**, on June 5 with '**Beat Plastic Pollution**' as its theme.

Background

- Government notified **Plastic Waste Management Rules, 2016**, to regulate manufacture, sale, distribution and use of plastic carry bags including those of compostable plastic, and plastic sheets for packaging or wrapping applications.
- **United Nations Environment Assembly**, in 2017, passed a resolution to eliminate plastic pollution in our seas. However, it is not a legally binding treaty.

Impact of plastic

- Causes cancers, birth defects, impaired immunity etc.
- Non-biodegradable nature as it can survive in environment for nearly 500 years.
- Marine animals are found to be feeding on **microplastics** and absorbing their hazardous chemicals. They are also displacing the algae needed to sustain larger sea life who feed on them.

Microplastics

- Plastic pieces that are less than 5mm in length are called microplastics. They can be formed by fragmentation of large plastic waste material. Microfibers from washing of textiles, microbeads

used in cosmetics personal care products such as toothpaste, and even paint from land run-offs can dump microplastics in the ocean.

- Microplastics are ingested directly by the zooplankton -- the lowest link in the food chain. The zooplankton is eaten by fish; and the microplastic finally reaches the seal, which consumes the fish.
- The Great Pacific Garbage Patch is almost entirely made up of microplastic.

Recently the larvae of wax moth have been shown to degrade polyethylene into ethylene glycol at a fast rate.

Plastic Waste (Management and Handling) Rules, 2016

- **Increase the minimum thickness:** of plastic carry bags from 40 microns to 50 microns. This would increase the cost and the tendency to provide free carry bags would come down.
- **Responsibility of local bodies:** Rural areas are brought under the rules since plastic has reached rural areas as well. The gram sabhas have been given responsibility of implementation.
- **Extended Producer Responsibility:** Under this, the producers and brand owners have been made responsible for collecting waste generated from their products.
- Producers are to keep a record of their vendors to whom they have supplied raw materials for manufacturing. This is to curb manufacturing of these products in unorganised sector.
- **Responsibility of waste generator:** All institutional generators of plastic waste shall segregate and store the waste generated by them in accordance with the Solid Waste Management Rules, and handover segregated wastes to authorized waste disposal facilities.
- **Responsibility of street vendors and retailers:** not to provide such carry bags or fine would be imposed. Only the registered shopkeepers on payment of a registration fee to local bodies would be allowed to give out plastic carry bags on charge.
- **Promote the use of plastic waste** in road construction, waste to energy, waste to oil etc.

Scheme for setting up of need-based Plastic Parks

- Under the scheme, Government of India provides grant funding up to 50% of the project cost, subject to a ceiling of Rs.40 crore per project
- **Objectives:** To increase competitiveness and investments, achieve environmentally sustainable growth and adopt the cluster development approach to consolidate the capacities in plastic sector.
- **Nodal office:** Department of Chemicals and Petrochemicals under Ministry of Chemicals and Fertilizers.

2.5. PESTICIDE POISONING

Why in News?

Recently, NHRC issued notices to the Centre as well as the Maharashtra government, for death of farmers and after inhaling poisonous pesticide in Yavatmal district.

Background

- Currently India is the largest producer of pesticides in Asia and ranks 12th in world for application of pesticides.
- Andhra Pradesh is the leading consumer of pesticide followed by Maharashtra and Punjab.

Government Initiatives for pesticide

- **Insecticide Act 1968**, was enacted to regulate imports, manufacture, storage, transport, sale, distribution and use of insecticides with a view to prevent risk to human beings and animals.
- Approval for the use of pesticides and new formulations on crops is given by the **Registration Committee of the Central Insecticide Board**. The health and family welfare ministry monitors and regulates pesticide levels in food, and sets limits for residues in food commodities.
- The Government of India has decided to ban the use of 18 pesticides following the recommendations of the **Anupam Varma Committee**.
- Department of Agriculture, Co-Operation & Farmers Welfare (DAC&FW) has launched a scheme **“Strengthening and Modernization of Pest Management Approach in India”** to promote **Integrated Pest Management (IPM)**.

Integrated Pest Management (IPM)

- It is an eco-friendly approach which aims at keeping pest population at below economic threshold levels.
- It does that by employing all available alternate pest control methods and techniques such as cultural, mechanical and biological with emphasis on use of bio-pesticides and pesticides of plant-origin like Neem formulations.
- The use of chemical pesticides is advised as a measure of last resort when pest population in the crop crosses economic threshold levels (ETL).
- National Policy statement on IPM was made in 1985 and later supported by National policy on

Agriculture - 2000 and National policy on Farmers - 2007.

- **“Grow Safe food”** Campaign has been initiated to create awareness about the safe and judicious use of pesticides among the various stakeholders.
- India is signatory to **United Nations Environment Programme (UNEP) led Stockholm Convention** for persistent organic pollutants and **Rotterdam convention** which promotes open exchange of information and calls on exporters of hazardous chemicals to use proper labelling, include directions on safe handling, and inform purchasers of any known restrictions or bans.

2.6. MINAMATA CONVENTION

Why in news?

- Recently, the Union Cabinet approved the proposal for ratification of Minamata Convention on Mercury enabling India to become a Party of the Convention.

More on news

- The approval entails ratification of the Minamata Convention on Mercury along with flexibility for continued use of mercury-based products and processes involving mercury compound up to 2025.
- The first Conference of the Parties (CoP) under the Minamata Convention took place in Geneva, Switzerland in 2017 which India attended as observer.
 - It adopted decisions on guidance to the Global Environment Facility through which the convention is financed.

Details about the convention

- The Minamata Convention on Mercury is **first global legally binding** treaty to protect human health and the environment from the **adverse effects of mercury**.
- It was agreed in Geneva, Switzerland in January 2013 and came into force in August, 2017.
- The Minamata Convention requires party nations to:
 - Reduce and where feasible eliminate the use and release of mercury from **artisanal and small-scale gold mining (ASGM)**.

- Control mercury air emissions from **coal-fired power plants**, coal-fired industrial boilers, certain non-ferrous metals production operations, waste incineration and cement production.
- Phase-out or take measures to reduce mercury use in certain products such as batteries, switches, lights, cosmetics, pesticides and measuring devices, and create initiatives to reduce the use of mercury in dental amalgam.
- Phase out or reduce the use of mercury in manufacturing processes such as chlor-alkali production, vinyl chloride monomer production, and acetaldehyde production.
- It also puts a ban on new mercury mines.
- The Convention also addresses interim storage of mercury and its disposal once it becomes waste, sites contaminated by mercury as well as health issues.

2.7. GLOBAL CLEAN SEAS CAMPAIGN

Why in news?

- Recently Indonesia declared a “Garbage emergency” as part of Global Clean Seas campaign.

About Clean Seas Campaign

- It is a global UN Environment initiative launched in 2017 to increase global awareness of the need to reduce marine plastic litter.
- The campaign is inspired from Mumbai’s Versova beach clean-up programme of Afroz Shah who also received Champions of the Earth award for the same.

About United Nations Environment Programme (UN Environment)

- It is the leading global environmental authority Headquartered in Nairobi, Kenya.
- It sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system
- It works as the secretariat for following environmental agreements and research bodies:

- The Convention on Biological Diversity
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora
- The Minamata Convention on Mercury
- The Basel, Rotterdam and Stockholm Conventions
- The Vienna Convention for the Protection of Ozone Layer and the Montreal Protocol
- The Convention on Migratory Species
- The Carpathian Convention
- The Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa
- The Tehran Convention: Framework Convention for the Protection of the Marine Environment of the Caspian Sea

Champions of the Earth award

- Launched in 2005, it is UN’s highest environmental honour.
- It recognizes dozens of exemplary individuals and organizations and celebrates outstanding figures from the public and private sectors and from civil society whose actions have had a transformative positive impact on the environment.

2.8. MOSS AS BIOINDICATOR

Why in news?

- According to Japanese scientists, **delicate mosses** found on rocks and trees in cities around the world can be used to **measure the impact of atmospheric change and monitor urban pollution**.

Bioindicator

- A bioindicator is a living organism that gives us an **idea of the health of an ecosystem**. Some organisms are very sensitive to pollution in their environment, so if pollutants are present, the organism may change its morphology, physiology or behaviour, or it could even die, allowing scientists to calculate atmospheric alterations.



Examples

- **To monitor air Pollution: Lichens** (a symbiosis among Cyano bacteria, algae, and/or fungi) and **Bryophytes** (a collective term for mosses, hornworts and liverworts).
- **To monitor water pollution:** Algae blooms are often used to indicate large increases of nitrates and phosphates (**Eutrophication**) in lakes and rivers.
- Other bio-indicators are bacteria, sparrow, butterflies etc.

3. BIODIVERSITY

3.1. INDIA STATE OF FOREST REPORT 2017

Why in news?

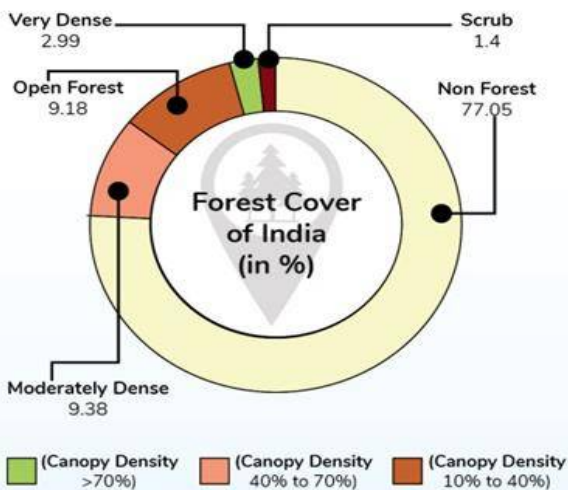
- Recently, Ministry of Environment, Forest and Climate Change (MoEFCC) released the biennial India State of Forest Report (ISFR) 2017, prepared by Forest Survey of India (FSI).

Forest Survey of India

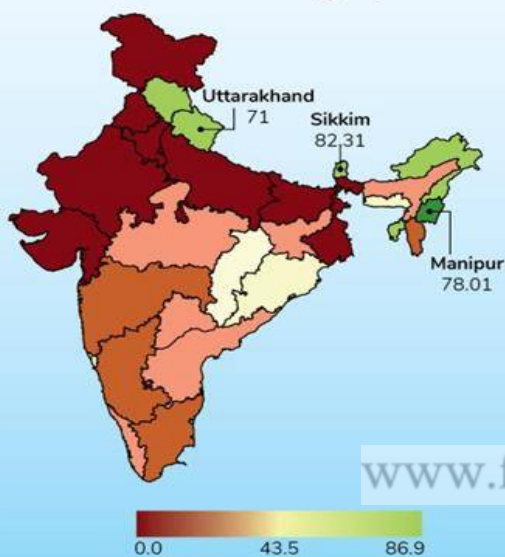
- It is a national organization, under MoEFCC, responsible for assessment and monitoring of the forest resources of the country regularly.
- It is also engaged in providing the services of training, research & extension.

GREEN COVER

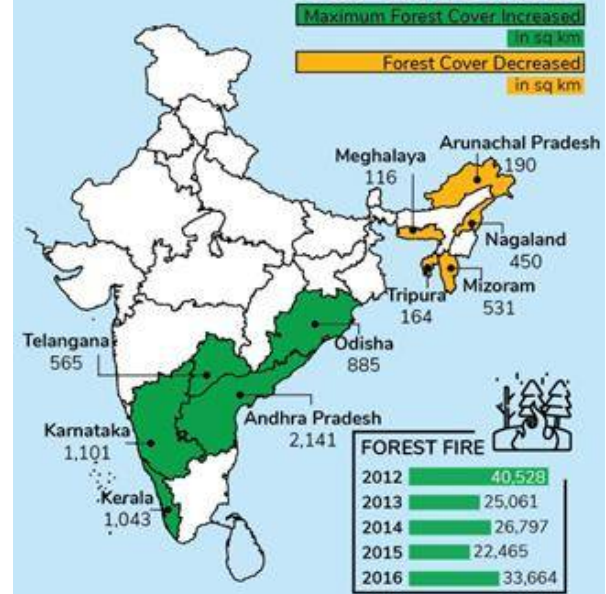
This time information of forest cover is covered for 633 districts in place of 589 districts.



Forests as % of Geographical area



TOP FIVE STATES



FOREST FIRE

2012	40,528
2013	25,061
2014	26,797
2015	22,465
2016	33,664

The main reasons for decrease in forest cover of North Eastern states are shifting cultivation, rotational felling, other biotic pressures, diversion of forest lands for developmental activities, submergence of forest cover, agriculture expansion and natural disasters.

Key findings

- Forest cover:**
 - India is ranked 10th in the world, with 24.4% of land area under forest (21.53%) and tree cover. The target is to achieve 33% of area under forest cover.
 - There is an increase of 1% (8,021 sq km) in the total forest and tree cover of the country, compared to the previous assessment in 2015.
 - The maximum increase in forest cover has been observed in Very Dense Forest (VDF) followed by increase in forest cover in open forest (OF).
 - The agro-forestry and private forestry has also shown expansion. There is also an increase in timber production in 'Trees outside Forests' (TOF) category.
- Forest cover in states:**
 - 15 states/UTs have above 33% of geographical area under forest cover.
 - 7 States/UTs have more than 75% forest cover: Mizoram, Lakshadweep, Andaman & Nicobar Islands, Arunachal Pradesh, Nagaland, Meghalaya and Manipur.
 - The three leading States with maximum Forest cover (in terms of area): Madhya Pradesh, Arunachal Pradesh and Chhattisgarh.

- States with highest Forest cover in terms of percentage geographical area: Lakshadweep (90.33%), Mizoram (86.27%) and Andaman & Nicobar Islands (81.73%)
- **Global trend:**
 - India has shown an increasing trend in the forest and tree cover, in comparison to the global trend of decreasing forest cover during the last decade.
 - As per the latest FAO report, India is placed 8th in the list of top ten nations reporting the greatest annual net gain in forest area.
- **Carbon stock:** There is an increase in the carbon stock of India bringing it to total 7083 million tonnes.
- **Forest fires:** In most of the years, maximum number of forest fires occurs in open forest (OF) followed by Moderately Dense Forests (MDF). However, in 2012 and 2016 (severe fire years), the proportion of forest fires in MDF and VDF were higher compared to OF.
- **Mangrove:** Total mangrove forests have increased by 181sq kms. 7 out of the 12 mangrove states have shown an increase in mangrove cover and none of them show any negative change.
- **Bamboo Cover:** There has been an increase of 1.73 million ha in bamboo areas.
- **Water bodies inside forests** - The report observes that water bodies inside forest cover have increased by 2,647 sqkms during the last decade. Almost all the states have shown a positive change in water bodies.

3.2. INCREASE IN INDIA'S BIODIVERSITY

Why in News?

- **Animal Discoveries 2016, New Species and Records**, brought out by the Zoological Survey of India, and **Plant Discoveries 2016**, by the Botanical Survey of India reported that 313 species of animal and 186 of plants have been discovered from various areas of the country last year.

More on News

- Most discoveries were made in the Western Ghats (17%), followed by the Eastern Himalayas (15%), the Western Himalayas

(13%), the Eastern Ghats (12%) and the west coast (8%)

- New biodiversity species were from the four **biological hotspots** of the country
 - **Himalaya:** Includes the entire Indian Himalayan region.
 - **Indo-Burma:** Includes entire North-eastern India, except Assam and Andaman group of Islands
 - **Sundalands:** Includes Nicobar group of Islands
 - **Western Ghats and Sri Lanka:** Includes entire Western Ghats.

Biodiversity Hotspot

- Term coined by **Norman Myers**
- **Conservation International** (American NGO) designates biodiversity hotspot.
- Criteria
 - Least 1,500 species of vascular plants (> 0.5% of the world's total) as endemics.
 - It has to have lost at least 70% of its original habitat.
- Total 36 biodiversity hotspots on Earth (4 in India)
- **Critical Ecosystem Partnership Fund (CEPF)** provides fund for management of hotspot.
- **CEPF** is joint initiative of l'Agence Française de Development, Conservation International, European Union, Global Environment Facility, Government of Japan, MacArthur Foundation and World Bank.

Botanical survey of India

- Established: 1890, HQ: Calcutta
- Evolved from **Royal Botanic Garden**: Sir George King
- Under Ministry of Environment Forest and Climate Change (MoEFCC).
- Undertaking intensive Plants surveys
- Collecting, identifying and distributing materials for scientific research.
- Custodian of authentic collections from Local, District, state and national Flora.

Zoological survey of India

- Established: 1916, HQ: Calcutta
- Evolved from **Asiatic Society of Bengal** and **Zoological Section of the Indian Museum**: Sir William Jones.
- Under Ministry of Environment Forest and Climate Change.
- Exploration, Survey, Inventorying and Monitoring of faunal diversity in various States, Ecosystems and Protected areas of India.
- Periodic review of the Status of Threatened and Endemic species.
- Preparation of Red Data Book, Fauna of India and Fauna of States.

3.3. INVASIVE ALIEN SPECIES

Why in news?

Recently, **National Conference on the Status of Invasive Species in India** was organised by Zoological Survey of India and the Botanical Survey of India in which ZSI announced a list of alien invasive animal species.

Findings of Zoological Survey of India:

- **ZSI** has made a list of 157 species of Invasive Alien Species (IAS) out of which 58 are found on land and freshwater habitat and 99 are found in marine ecosystem.
- Common Alien Animal Species found in India are –
 - **African Apple Snail** – found in Andaman and Nicobar Island, now spread across the whole country
 - **Papaya Mealy Bug** – massively affected papaya crop in Assam, West Bengal and Tamil Nadu
 - **Cotton Mealy Bug** – threat to cotton crops in Deccan
 - **Amazon sailfin catfish** – responsible for destroying fish population in wetlands
 - **Orange Cup-Coral** – originated in Indo-East Pacific, now also found in Andaman and Nicobar Island, Gulf of Kutch, Kerala and Lakshadweep.
 - **Primrose Willow** -It is an aquatic plant native to Central and South America. It flourishes in sandy and mineral rich soil of wetlands. First seen in Karbi Anglong district of Assam and is now spreading in Tamil Nadu, Kerala, the Andaman & Nicobar Islands and West Bengal.

What are Invasive Alien Species?

- “An alien species is a species that is established outside of its natural past or present distribution, whose introduction and/or spread threaten biological diversity” **Convention of Biodiversity (CBD).**
- According to IUCN, around 5% to 20% of alien species become invasive and is second most serious threat to the biodiversity after global warming.
- IAS are found in all taxonomic groups such as animals, plants, fungi etc. and can affect all types of ecosystems.
- The most common characteristics of IAS are –
 - Rapid reproduction and growth

- High dispersal capability
- Ability to survive on various food types in wide range of environmental conditions
- Ability to adapt physiologically to new conditions (phenotypic plasticity)
- Spread of IAS has become a threat due to -
 - Increased movement of people and goods around the world (globalisation)
 - Escape from farms and horticulture
 - Through ship ballast water
 - Spread through man-made corridors such as canals.

Steps taken to control Invasive Alien Species (IAS)

- **Article 8(h) of CBD and Aichi Target 9** aim to control or eradicate alien species which threaten ecosystems, habitats and species.
- **Global Invasive Species Program** is supporting to implement **Article 8(h) of CBD** with IUCN as partner organization and also working to address the global threat to IAS.
- **IUCN's Invasive Species Specialist Group** has also been working to promote and facilitate the **exchange of IAS information and knowledge** across the globe and ensure linkages between policy making and flow of knowledge.
- **IUCN** has also developed a number of global databases which provide critical information on IAS such as **Global Invasive Species Database** and **the Global Register of Introduced and Invasive Species.**

3.4. FAUNA

3.4.1. IRRAWADDY DOLPHIN

Why in news?

The status of the Irrawaddy dolphin has been raised from “vulnerable” to “endangered” in the latest Red List of threatened species produced by the International Union for Conservation of Nature (IUCN).

The International Union for Conservation of Nature (IUCN) is a membership Union uniquely composed of both government and civil society organisations.

The IUCN Red List of **Threatened Species** is the world's most comprehensive inventory of the global conservation status of **plant, animal and fungi species**. It uses a set of criteria to evaluate the extinction risk of thousands of species and **subspecies**. The **IUCN Species Survival Commission (SSC)** is a science-based network of more than 7,500 volunteer experts from almost every country of the world.

About the dolphins

- Irrawaddy Dolphins are found in the **Ganges, Brahmaputra, Irrawaddy and Mekong rivers**.
- This species is also known to be found in the tropical waters of the Indo-Pacific, from northern Australia and New Guinea through South-East Asia to the Bay of Bengal, which forms the western limit of its range.
- Total population of these animals in the world is estimated to be less than 7,500 with highest being little over 6,000 reported from Bangladesh.
- The population of Irrawaddy dolphins in Chilika is considered to be the highest single lagoon population with recorded head count of 121 in 2017.
- It has been included in Schedule I of **Wildlife protection act**, schedule I of CMS, Schedule II of CITES. **(Details of CMS and CITES are covered later.)**

Wildlife (Protection) Act, 1972

- The Act provides for the protection of wild animals, birds and plants; and for matters connected therewith or ancillary or incidental thereto. It extends to the whole of India, **except the State of Jammu and Kashmir** which has its own wildlife act. It has six schedules which give varying degrees of protection.
- Schedule I and part II of Schedule II provide absolute protection - offences under these are prescribed the highest penalties.
- Species listed in Schedule III and Schedule IV are also protected, but the penalties are much lower.
- Schedule V includes the animals which may be hunted. The Wildlife Act empowers every State's Chief Wildlife Warden to authorise hunters to cull **vermin animals** in a region where they are a proven nuisance. These are Common crow, Fruit bats, Mice & Rats only. States can send a list of wild animals to the Centre requesting it to declare them vermin for selective slaughter.
- Schedule VI contains the plants, which are prohibited from cultivation and planting.

Note:

- Wild boars, nilgai and rhesus monkeys are protected under Schedule II and III but can be hunted under specific conditions.
- Wild boars are scavengers in the food chain and furrowing by them ensures germination of seeds in the forest area.

National board for wildlife

- National Board for Wild Life is a "**Statutory Organization**" constituted under the Wildlife Protection Act, 1972.
- It is **chaired by India's Prime Minister** and its vice

chairman is Minister of Environment. It has power to review all wildlife-related matters and approve projects in and around national parks and sanctuaries.

- No alternation of boundaries in national parks and wildlife sanctuaries can be done without approval of the NBWL.
- It advises the Central Government on framing policies and measures for conservation of wildlife in the country.

3.4.2. INDIAN STAR TORTOISES

Why in news?

Chinnar Wildlife Sanctuary (CWS) has successfully rehabilitated Indian star tortoises, making it the only rehabilitation centre for star tortoises in the country.

About Indian star tortoise

- This species naturally inhabits **scrub forests, grasslands, and some coastal scrublands of arid and semi-arid regions**.
- It is found in northwestern India (Gujarat, Rajasthan) and adjoining southeastern Pakistan; eastern and southern areas from Tamil Nadu, Andhra Pradesh and eastern Karnataka to Odisha and throughout Sri Lanka
- Threats to this species survival include illegal collection and habitat loss.
- Included in Appendix II of the CITES
- **IUCN status: vulnerable**
- Placed under **Schedule IV of the Wildlife (Protection) Act 1972**.

About Chinnar wildlife sanctuary

- Chinnar Wildlife Sanctuary is a **unique protected area** located in the rain shadow region in the eastern slope of Western Ghats in **Idukki in Kerala**.
- It supports a population of grizzled giant squirrel, gaur etc.

3.4.3. NORTHERN RIVER TERRAPIN (BATAGUR BASKA)

Why in news?

- The **Sunderban Tiger Reserve** with support from experts at **Turtle Survival Alliance (TSA)**, have coordinated a recovery program for Batagur baska (the world's second most endangered turtle), through captive conservation breeding.

Details

- The **genus Batagur** includes six large fresh water turtles, out of which three are found in India. Batagur kachuga (Red-crowned roofed turtle) and Batagur dhongoka (Three-striped roofed turtle) are found in the tributaries of the Ganga, such as Chambal.
- The Northern river terrapin is the most endangered of the three species. It occupies a river estuarine habitat.
- This is presumed extinct in several Southeast Asian countries and is classified as **critically endangered** by the International Union for Conservation of Nature (IUCN).

Turtle Survival Alliance (TSA)

The Turtle Survival Alliance (TSA) was organized in 2001 in response to the Asian Turtle Crisis.

It functioned within the IUCN (World Conservation Union) structure.

It organized a diverse partnership involving zoos and aquariums, universities, private breeders and serious hobbyists, veterinarians, conservation NGOs, range country turtle facilities and turtle rescue organizations.

About turtles

- Turtles play a **critical ecological role** in the environments in which they occur. For example, freshwater turtles help control aquatic vegetation, serve as scavengers and help maintain rivers and lakes in a healthy condition. In addition, turtles occupy a significant role in the cultures of many people around the world.

3.4.4. INDIAN WILD DOGS (DHOLES)

Why in news?

The Indira Gandhi Zoological Park (IGZP), situated in Vishakapatnam plans to reintroduce a pack of 16 dholes into the forests.

About dholes

- Dholes occur in several regions of India such as the Western Ghats, central Indian forests, Eastern Ghats, northeastern states and Terai region in north India.
- In the Himalayan region, they are found in **Sikkim and Ladakh**
- Protected under **Schedule 2** of the Wildlife (Protection) Act, 1972
- Listed as '**endangered**' by the International Union for Conservation of Nature (IUCN).

3.4.5. BUSTARD BREEDING CENTER

Why in news?

The Rajasthan government will set up a captive breeding centre for the Great Indian bustard.

Background

- This will be the **first such facility** in the country aimed at saving the bird, which is the State bird of Rajasthan.
- Rajasthan accounts for 95% of the total world population of Great Indian bustard.

About Great Indian bustard

- A large bird with a horizontal body and long bare legs giving it an ostrich like appearance
- This bird is among the **heaviest of the flying birds**.
- Found in central India, western India and eastern Pakistan.**
- Habitat: Arid and semi-arid grasslands, open country with thorn scrub, tall grass interspersed with cultivation. It avoids irrigated areas.
- Listed in **Schedule I** of the Wildlife (Protection) Act, 1972 and **CMS or Bonn Convention**.
- It is also listed in Appendix I of CITES, as **Critically Endangered on the IUCN Red List**.
- It has also been identified as one of the species for the recovery programme under the **Integrated Development of Wildlife Habitats** of the Ministry of Environment and Forests.
- The biggest threat to this species is hunting. This is followed by occasional poaching outside Protected Areas, collisions with high tension electric wires, fast moving vehicles and free-ranging dogs in villages.

Integrated Development of Wildlife Habitats

It is a Centrally Sponsored Scheme where GoI provides financial and technical assistance to the State/UT Governments for activities aimed at wildlife conservation. The scheme has following three components:

- Support to Protected Areas** (National Parks, Wildlife Sanctuaries, Conservation Reserves and Community Reserves)
- Protection of Wildlife Outside Protected Area**
- Recovery programmes for saving critically endangered species and habitats.**
- It covers 17 species such as** Snow Leopard, Bustard (including Floricans), Dolphin, Hangul,

Nilgiri Tahr, Marine Turtles, Dugongs, Edible Nest Swiftlet, Asian Wild Buffalo, Nicobar Megapode, Manipur Brow-antlered Deer, Vultures, Malabar Civet, Indian Rhinoceros, Asiatic Lion, Swamp Deer and Jerdon's Courser.

3.4.6. BLACK NECKED CRANE

Why in news?

The cranes are facing huge threats especially in Arunachal Pradesh.

About the crane

- **Migratory bird** most commonly found in China.
- It is legally protected in Bhutan and India and is considered sacred to certain Buddhist traditions.
- **IUCN status – Vulnerable**
- Listed in India's Wildlife Act as a **Schedule 1 species**
- It is locally known as **DhungDhung Karma**.
- It is the only high-altitude crane amongst the 15-species found in the world.
- These birds build their nests in vast open environments, making them vulnerable to a host of predators.

3.4.7. AMUR FALCON

Why in news?

Amur Falcon were spotted at UmredKarhandla Wildlife Sanctuary near Nagpur.

About Amur Falcon

- Amur Falcons are **the migratory bird** that stay every year at **Doyang lake** (Nagaland) during their flight from Mongolia to South Africa
- **Pangti village** in Nagaland is considered as the world's Amur Falcon capital
- Centre will soon develop the Doyang Lake area as an eco-tourism spot for bird-watchers across the world.
- Until recently, Amur falcons were hunted by Naga tribesmen for meat.

UmredKarhandla Wildlife Sanctuary

- It is situated in **Maharashtra** and is 60 km from Nagpur.
- Umred-Karhandla Wildlife Sanctuary is declared as the **satellite core** of Bor Tiger Reserve by national tiger conservation authority.

- It is the first sanctuary in Maharashtra to be declared as 'satellite core', which means a sub-protected area supporting another protected area.

3.4.8. SANGAI DEER

Why in news?

The annual Sangai Festival was celebrated in the northeastern state of Manipur.

About Sangai Deer

- The Sangai is an endemic, rare and critically endangered subspecies of brow antlered deer found only in Manipur.
- It is also the state animal of Manipur
- Its habitat is restricted to the marshy wetland of Keibul Lamjao National Park over the floating biomass in Loktak lake which is locally called 'phumdi'.
- While walking on the floating biomass, Sangai often balances itself which looks as if it is dancing on the green grassland and therefore popularly called as 'dancing deer' of Manipur.
- It is classified as 'endangered' by the IUCN and is part of MoEFCC's 'Recovery Programme for critically endangered species and habitats'.

3.4.9. MOUSE DEER

Why in news?

Recently, Telangana Forest Department released 8 mouse deer from captivity into Amrabad Tiger Reserve (Telangana).

More about Mouse Deer

- It is a species of deer usually found in the **deciduous and evergreen forests** of the country also called 'spotted Chevrotain' and mostly inhabits Tamil Nadu and Kerala. It is also found in Madhya Pradesh and Rajasthan.
- They are nocturnal and are also known as smallest ungulates (deer) and are endangered because of **habitat destruction and poaching**.
- The Species is also listed in **Schedule I of the Indian Wildlife Protection Act (1972)** and occurs in numerous protected areas



throughout its range. However, IUCN has kept the species under **Least Concerned category**.

3.4.10. NILGIRI TAHR

Why in News?

- The **first ever State-wide** population estimation of Nilgiri Tahrs, has put the total population of the endangered species at 1,420,

Nilgiri Tahr

- State animal of Tamil Nadu.
- Endemic:** Western Ghats from the Nilgiris to Kanyakumari.
- IUCN status: **Endangered status** (because number fewer than 2,500 mature individuals).
- Protected (**Schedule I**) by the Indian **Wildlife (Protection) Act of 1972**.
- Confined to a narrow belt of higher elevation of Shola Forest.

More on the News

- In 2013, Standing Committee of the National Board for Wildlife planned to reintroduce Nilgiri Tahr into Mudanthurai tiger reserve.
- Majority of number is 664 at the Eravikulam National Park in Munnar.
- Found in Eravikulam National Park, Adimali forest (Idukki), Silant Valley National Park, Mundanthurai Tiger Reserve.

3.4.11. CHIRU ANTELOPE

Why in news?

The Ministry of Environment and Forests has refused to allow captive breeding of the Chiru goats (Tibetan antelope).

- A Parliament panel has recommended that the ministry should conserve and breed the Chiru goat, which can then be given to shawl makers for collecting hair.
- This would increase the number of these goats but would also add to the sustainable livelihood opportunities of the people of Jammu and Kashmir.

Captive Breeding

Captive breeding is the process of breeding animals outside of their natural environment in restricted conditions in farms, zoos or other closed facilities. The choice of individual animals that are to be part of a captive breeding population, and the mating partners within that population, are controlled by humans.

Aim:

- To produce animals for commercial purposes (pets, food, fibre, medicine, and other human uses).
- To create a sizable, stable, and healthy population in order to avoid extinction
- To reintroduce species back into their natural habitats, when conditions allow

It has saved some species from extinction, including black-footed ferrets and California condors.

Risks associated:

- Disease spread, social disruption and the introduction of alien genes
- threatened or endangered species are bred for commercial purposes
- lack of international standards for zoos and captive breeding operations

Details

- The Chiru is assessed as **'Near Threatened'** by the International Union for Conservation of Nature 2017.
- China and Mongolia** are breeding Chiru goats (Tibetan antelope) for its wool, which is very expensive. The cost of an embroidered **shahtoosh shawl** can run into crores of rupees.
- Chiru have long been hunted for their underfur, which is renowned for its quality.
- It takes three to five hides to make a single shawl, and the wool cannot be sheared or combed; to collect the fur, the animals have to be killed. The **shawls' sale and possession are banned** in India and in many countries.

3.4.12. NEW MOTH SPECIES

Why in News?

- Recently, new Moth species has been discovered in **Talle Wildlife Sanctuary** in Arunachal Pradesh.

More on News

- It is the first record of this moth species (*Elcysma*) in Arunachal Pradesh.
- The scientifically name of moth is **Elcysma Ziroensis**, and commonly called Apatani Glory, named after a **local tribe called Apatani**.
- This moth species has one brood of offspring per year.

Talle Wildlife Sanctuary

- It lies roughly in between the Subansiri, Sipu and Pange Rivers.



- It is one of the home for clouded leopard (**Vulnerable IUCN status**).
- Sub-tropical broad leafed, temperate broad leafed and temperate conifer types of vegetation are found here.

Apatani tribe

- They are one of the major ethnic groups of eastern Himalayas.
- The tribe is known for their colorful culture with various festivals, intricate handloom designs, skills in cane and bamboo crafts, and vibrant traditional village councils called bulyañ.
- The community has evolved a unique skill of rice-fish cultivation where along with paddy, fish is also reared on the fields.
- **Apatani Tribal Cultural Landscape** is in tentative list of UNESCO World Heritage Sites for 'extremely high productivity' and 'unique' ways of preserving ecology.

Other protected areas in Arunachal Pradesh

- **Wildlife Sanctuary:** Itanagar, Lao, Mehao, Dibang Eagle's Nest Sanctuary, Kamlang, Kane.
- **National Park:** Namdapha, Mouling
- **Biospheric Reserve:** Dihang-Dibang Biosphere Reserve.

3.4.13. BIODIVERSITY AROUND THE DEEP-SEA VENTS

Background

- Deep sea vents are found on the sea floor through which the **geo-thermally heated water, minerals and gas** comes out. The hydro-thermal vents are formed near the **oceanic ridges** where the two tectonic plates intersect e.g. **Sister Peak and Turtle Pit in Mid Oceanic Ridge, Atlantic Ocean**.
- The water is heated through **contact of molten crust**, thus increasing the temperature of the area up to 400 degrees centigrade. These vents also form a feature known as **black smokers**.
- Hydrothermal also have huge potential for **mineral exploration** as the vents are rich in **Poly Metallic Nodules**.

Benthic Organism in Hydro-thermal Vents

- Usually the life on the earth is driven by the light energy from the Sun. However, the benthic organisms in the hydrothermal vents depend on the **chemosynthetic bacteria** for food.
- The water in the hydrothermal vents is rich in **dissolved minerals** and forms the **energy base** for the chemosynthetic bacteria. The

benthic organisms found in these vents are host to the chemosynthetic bacteria found in their bodies, thus living in **symbiotic relationship**.

- These bacteria oxidise the sulphides or elemental sulphur to derive energy.

3.5. FLORA

3.5.1. SUNDERBANS STEADILY LOSING ITS FAMED MANGROVES

Why in News?

- Study conducted by School of Oceanographic Studies, Jadavpur University, reveals that from 1986 to 2012, 124.418 sq. km. mangrove forest cover has been lost.
- Recently, Zoological Survey of India (ZSI) has published a compendium of animal species in the Indian Sunderbans, estimating that there are 2,626 of them in the fragile island ecosystem.

More on News

- The loss in the mangrove forest in the Indian Sunderbans is about 5.5 % of total area since 1986.
- There rising mean seas level is driving factor for coastal erosion, coastal flooding, and an increase in the number of tidal creeks.
- Jambudwip, one of the smallest uninhabited islands at the mouth of the sea, also has reduced forest cover from 6.095 sq. km. in 1986 to 5.003 sq. km. in 2012, or about 10%.

Reasons for decrease

- Commercialisation of Golpata tree in order to produce oil and alcohol for human consumption.
- Logging of Sundri trees for timber and pulp.
- **Artificial Plantation** being done for aesthetic purposes.
- **Shrimp culture** has grievously threatened the mangroves.
- **Oil Spillage** is one of the major man-made causes of mangrove degradation.

Feature of Sunderbans

- It is classified as a moist tropical forest dominated by "Sundri tree"
- It is a UNESCO world heritage site.
- It is the largest single block of halophytic mangrove forest in the world.
- It has common features of the both estuarine and mangrove ecosystem and acts as agent of carbon

Sequestration

- Its area lies both in India and Bangladesh (Largest in Bangladesh).
- It acts as shelter belt to protect the people from storms, cyclones, tidal surges, sea water seepage and intrusion.
- It is **the only mangrove reserve** in the world **inhabited by tigers**
- This reserve includes
 - The Royal Bengal Tiger Reserve.
 - Sundarban National Park.
 - Sajnekhali wildlife sanctuary.
 - Lothian Island wildlife sanctuary.
 - Holiday Island wildlife sanctuary.

Mangrove for Future

- A regional initiative, being coordinated by United Nations Development Programme (UNDP) and International Union for the Conservation of Nature (IUCN).
- It aims at promoting coastal ecosystem conservation in six tsunami-hit countries including India.
- Mangrove for the Future (MFF) programme in India provides focus on promoting conservation and management of coastal and marine biodiversity, while mangrove ecosystems are at centre-stage, on three important aspects:
 1. Coastal restoration;
 2. Coastal livelihoods; and
 3. Integrated coastal zone management

3.5.2. BAMBOO IS NO LONGER A TREE

Why in News?

- Recently, President has cleared an ordinance amending the Indian Forest Act (IFA) 1972, to exempt bamboo grown in non-forest areas from the definition of trees.

More on News

- The amendment aims to **exempt bamboo grown in non-forest areas** from definition of tree, thereby dispensing with the requirement of felling/transit permit for its economic use.
- Bamboo, though, taxonomically a grass, was defined as a tree under the Indian Forest Act, 1927 which meant that the felling and transit of bamboo grown on forest as well non-forest land for economic use required permit. This was a major impediment for bamboo cultivation by farmers on non-forest land.
- However, bamboo grown in the forest areas shall continue to be governed by the provisions of Indian Forest Act, 1927.

Benefits of amendment

- It will promote cultivation of bamboo in non-forest areas to achieve twin objectives of **increasing the income of farmers**, especially in North-East and Central India and also **increasing the green cover of the country**.
- It will create a viable option for **cultivation in 12.6 million hectares of cultivable waste land by removing the legal and regulatory hardships** being faced by farmers and private individuals.
- The amendment will unleash the potential of bamboo in terms of **rural and national economy** apart from **ecological benefits** such as soil-moisture conservation, landslide prevention and rehabilitation, conserving wildlife habitat, enhancing source of bio-mass, besides serving as a substitute for timber.
- It will **encourage farmers** and other individuals to take up plantation/ block plantation of suitable bamboo species on degraded land, in addition to plantation on agricultural land and other private lands **under agroforestry mission**.
- It will **enhance supply of raw material** to the traditional craftsmen of rural India, bamboo based/ paper & pulp industries, cottage industries, etc.
- Besides **promoting major bamboo applications** such as wood substitutes and composites like panels, flooring, furniture and bamboo blind, it will also help industries such as those dealing with food products (bamboo shoots), constructions and housing, bamboo charcoal etc.
- It will help to **fulfill domestic demand and reduce the imports**. Though India has 19% share of world's area under bamboo cultivation (India is the world's second largest bamboo producer), its market share in the sector is only 6%. In 2015, India imported about 18.01 million cubic meters of timber and allied products worth Rs 43000 crores.
- The amendment will greatly aid the **National Agro-Forestry & Bamboo Mission (NABM)**.

National Agro-Forestry & Bamboo Mission (NABM)

- It envisages promoting holistic growth of bamboo sector by adopting area-based, regionally differentiated strategy and to increase the area under bamboo cultivation and marketing.
- Steps have been taken to increase the availability of quality planting material by supporting the

setting up of new nurseries and strengthening of existing ones.

- To address forward integration, the Mission is taking steps to strengthen marketing of bamboo products, especially those of handicraft items.
- It is being implemented by the Department of Agriculture & Cooperation (DAC), Ministry of Agriculture as a sub scheme under the Mission for Integrated Development of Horticulture (MIDH).

The International Network for Bamboo and Rattan (INBAR)

- INBAR connects a global network of partners from the government, private, and not-for-profit sectors in over 50 countries to define and implement a global agenda for sustainable development through bamboo and rattan.
- India is a Founding Member.

3.5.3. COBRA LILY

Why in news?

The cobra lily, a rare species of lilies was recently rediscovered in the western Nilgiris after 84 years.

About cobra lily

- The cobra lily is a **predatory plant native to Northern California and Southern Oregon**.
- In India they can be found only in a small area measuring less than 10 square kilometres in the **Shola forests in Nilgiris**.
- The Toda tribals of the Nilgiris, who know the plant well, have an embroidery motif known as the 'podwarshk', which resembles it.
- Cobra lilies are at a **great risk of extinction** from the commercial trade in exotic plants.
- **Predatory plants** have evolved into carnivorous plants that capture and digest insects as a means of obtaining nitrates as these plants are usually associated with leached, nutrient-poor soils, or wet and acidic areas that are ill-drained.

Shola Forests: These are the temperate forests found in Nilgiris, Annamalai and Palani Hills.

- They represent the continuation of the evergreen forest in response to elevation gradient, the sequence being Wet Evergreen >> Subtropical Hill Forest >> Montane Wet Temperate Forest.
- The endangered Nilgiri Tahr is endemic to Shola forests.
- Trees found here are Mahogany, Gular fig, Rhododendron etc.

Related information

- Of the 140 species of **Nepenthes (tropical pitcher plant)** distributed across the world, mainly in

Madagascar, the Seychelles, Sri Lanka and Australia, only one — **Nepenthes khasiana** — is known to occur in India, in the **Khasi and Jaintia hills of Meghalaya**.

- The leaves of the plant get modified into a pouch-like structure with a lid on top. The pouch produces enzymes that can kill insects and even small rodents.
- Recently, scientists at the Jawaharlal Nehru Tropical Botanic Gardens and Research Institute have come up with evidence that some carnivorous plants use carbon dioxide (CO₂) to attract insects and ants to their prey traps.

3.5.4. RED SANDERS

Why in news?

Recently it was reported that the smuggling of red sanders from the forest of Andhra Pradesh has started again through new routes instead of traditional route.

Red Sanders

- Red Sanders is an **endemic tree** of South India.
- They are found in **Tropical Dry Deciduous Forest** of the Palakonda and Seshachalam hill ranges of Andhra Pradesh and also found in Tamil Nadu and Karnataka.
- Red Sanders usually grows in the rocky, degraded and fallow lands with Red Soil and hot and dry climate.
- IUCN has put it under the category of **endangered species** in the Red List due to the dwindling population because of illegal felling and smuggling.
- It is used for various purposes such as immunity medicine, furniture, radiation absorbent, musical instrument, food dyes and spices, Ayurveda and Sidha medicine, decorative and ornamental purposes etc.
- It is a rare kind of sandalwood, high in demand internationally due to its **red colored wood**. The major markets for the wood are – China, Japan, Middle East, Sri Lanka, Bhutan and Nepal.
- Its export is banned in India in accordance with the **CITES and Wildlife Protection Act 1972**. However, its smuggling is rife and is rampant in the southern states of Karnataka, Andhra Pradesh and Tamil Nadu.

3.5.5. NILAMBUR TEAK

Why in news?

Recently, teak grown in Nilambur region was accorded Geographical Indication (GI) tag by the Geographical Indication (GI) Registry

About the news

- It is also known as **Malabar teak** and the **Mecca of Teak**.
- It is the **first forest produce** to get GI tag.
- It is known for its durability, earthy colour and larger size.
- It exhibits **high resistance to fungal decay** and shows **antioxidant properties** making it ideal for usage in construction purposes like Buckingham Palace, the Kabba building in Mecca, the Titanic etc.
- It is also known for hydrophobicity and its oily nature.
- Teak also has the **highest capacity for carbon sequestration** among trees in India.

3.6. CONSERVATION MEASURES

3.6.1. GLOBAL WILDLIFE PROGRAM

Why in news?

Recently, India hosted Global Wildlife Program during which India's National Wildlife Action Plan (NWAP) for the period 2017-2031 and Secure Himalaya were released.

Global Wildlife Program

- "Global Partnership on Wildlife Conservation and Crime Prevention for sustainable development" program also known as **Global Wildlife Program (GWP)** was launched in response to increasing crime against animals in natural habitat.
- It works towards **wildlife conservation and sustainable development** by fighting against illicit trafficking in wildlife through a holistic comprehensive approach.
- India is a partner country of Global Wildlife Program along with other Asian and African countries.

Implementing Agencies: World Bank Group, United Nations Development Programme (UNDP), United Nations Environment Programme (UNEP) & Asian Development Bank (ADB).

Other Collaborating Partners: International Consortium to Combat Wildlife Crime (ICWC), Wildlife Conservation Society (WCS), The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Secretariat, World Wildlife Fund (WWF), International Union for the Conservation

of Nature (IUCN), TRAFFIC, WildAid.

Priorities of Global Wildlife Program

- Promoting community-based resource management, achieve biodiversity goals and tourism development
- Increasing knowledge sharing and enhance collaboration,
- Implement monitoring and evaluation framework
- Promote donor cooperation and ensure proper monitoring of international fund

3.6.2. NATIONAL WILDLIFE ACTION PLAN (NWAP) FOR 2017-2031

- **Important Components of NWAP 2017-2031**
 - strengthening and promoting the **integrated management of wildlife and their habitats**
 - adaptation to **climate change** and promoting integrated sustainable management of **aquatic biodiversity** in India
 - promoting **eco-tourism, nature education and participatory management**
 - strengthening **wildlife research** and monitoring of **development of human resources** in wildlife conservation
 - **enabling policies and resources** for conservation of wildlife in India.
- The plan has adopted the **Landscape approach** rather than the earlier strategies more concentrated on national parks and wildlife sanctuaries.
- **The Landscape approach** is based on the importance of conservation of uncultivated flora and undomesticated fauna that had ecological value irrespective of their place of occurrence.
- Plan also highlights role of **private sector** in the wildlife protection by ensuring adequate fund flow from the **Corporate Social Responsibility (CSR) fund**.
- It also emphasizes upon preservation of **genetic diversity** and sustainable utilization of species and ecosystem.

3.6.3. SECURE HIMALAYA

The **Ministry of Environment, forest and climate change** in collaboration with **UNDP** has launched a six-year project to ensure conservation of locally and globally significant biodiversity, land and forest resources in the high Himalayan ecosystem spread over four states in India.

The project aims to:

- **Sustain critical ecosystem services** (such as fresh water, erosion reduction, mineral resources, land for food crops, medicinal plants, etc.)
- **Conserve vulnerable snow leopards** and other endangered species by securing community livelihoods, enhancing enforcement, strengthening community institutions,
- **Improve knowledge, advocacy and information systems** for promoting landscape-based conservation approaches.
 - Specific landscapes (Alpine pastures, sub-alpine forest and critical watersheds) under SECURE Himalayas are:
 - Changthang (Jammu and Kashmir)
 - Lahaul – Pangi and Kinnaur (Himachal Pradesh)
 - Gangotri – Govind and Darma – Byans Valley in Pithoragarh (Uttarakhand)
 - Kanchenzonga – Upper Teesta Valley (Sikkim).

Snow Leopard

- Recently, International Union of Concerned Scientists (IUCN) down listed the Snow Leopard from its list of endangered species to vulnerable list.

Project Snow Leopard (2009)

- It was launched to safeguard and conserve India's unique **natural heritage of high-altitude wildlife populations** and their habitats by promoting conservation through participatory policies and actions.
- Project is **operational in five Himalayan States** viz. Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh
- **Threat:** Snow leopard — at the apex of ecological pyramid — suffered the most, partly on account of their relatively smaller population and also because of man-animal conflict. This situation got aggravated by the hostile landscape forming its habitat.

Status of Snow Leopard:

- **Schedule I** under Wildlife (Protection) Act 1972
- **Appendix I of the Convention on International Trade of Endangered Species (CITES)**, which makes trading of animal body parts (i.e., fur, bones and meat) illegal in signatory countries
- **Appendix I** Convention on Migratory Species (CMS)

The Global Snow Leopard & Ecosystem Protection Program, GSLEP: Under this program, snow leopard range countries have committed to securing 20 landscapes across the cat's range by 2020.

Other major Government steps to protect Himalayan Ecosystem

- **The National Mission for Sustaining the Himalayan Ecosystem (NMSHE).**
- Himalayan Research Fellowships Scheme under the ministry of environment, forest and climate change (MoEFCC)
 - **Aim:** The scheme aims to create a young pool of trained environmental managers, ecologists and socio-economists. This pool will help generate information on physical, biological, managerial and human aspects of Himalayan environment and development.
 - **Implementation:** The fellowship scheme will be executed through various universities and institutions working in the Indian Himalayan Region (IHR) and preference will be given to the Institutions from north-eastern states.
 - **Funding:** The financial support will be provided under the **National Mission on Himalayan Studies (NMHS)** and the fellowships will be awarded for a maximum period of three years.
 - **Focus areas:** The research may be undertaken in any of the identified broad thematic areas (BTAs) of the NMHS such as water resource management including rejuvenation of springs and catchments, hydropower development, assessment and prediction of water-induced hazards, livelihood options including ecotourism opportunities, biodiversity management including recovery of threatened species and skill development.

The Government of India in 2015 launched the **"National Mission on Himalayan Studies (NMHS)"** a Central Sector (CS) Grant-in-Aid Scheme with a vision "to support the sustenance and enhancement of the ecological, natural, cultural and socioeconomic capital assets and values of the Indian Himalayan Region (IHR). The Mission has been revamped recently and focussing on Demand Driven Action Research on the Thematic Areas- (i) **Water Management** (ii) **Livelihood Options and Employment Generation** (iii) **Biodiversity Conservation and Management** and (iv) **Skill Development and Capacity Building**.

The National Mission for Sustaining the Himalayan Ecosystem (NMSHE) is one of the eight missions under the National Action Plan on Climate Change (NAPCC).

- It is a multi-pronged, cross-cutting mission across various sectors.
- It contributes to the sustainable development of the country by enhancing the understanding of climate change, its likely impacts and adaptation actions required for the Himalayas- a region on which a significant proportion of India's population depends for sustenance.
- It seeks to facilitate formulation of appropriate policy measures and time-bound action programmes to sustain ecological resilience and ensure the continued provisions of key ecosystem services in the Himalayas.
- It intends to evolve suitable management and policy measures for sustaining and safeguarding the Himalayan ecosystem along with developing capacities at the national level to continuously assess its health status.

3.6.4. INDIA AWARDED BY CITES

Why in news?

- India has been awarded a certificate of commendation by the **Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES)** for its effort to combat illegal wildlife trade.

CITES

- It is an international agreement between governments which aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival.
- It was drafted as a result of a resolution adopted in 1963 at a meeting of members of IUCN.
- The convention is legally binding on the parties such that domestic legislation ensures the implementation of CITES at the national level.
- World wildlife day is celebrated on 3rd March, the date of adoption of CITES.
- Appendix I lists species that are threatened with extinction and CITES prohibits international trade in specimens of these species except for scientific research.
- Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. No import permit is necessary for these species under CITES.
- Appendix III is a list of species included at the request of a Party that already regulates trade in the species and that needs the cooperation of other countries to prevent unsustainable or illegal exploitation

Wildlife Crime Control Bureau

- It is a **statutory multi-disciplinary** body established by the Government of India under the **Ministry of Environment and Forests**, to combat organized wildlife crime in the country.

- **It was constituted in 2007 by amending the Wildlife Protection Act, 1972.**
- It also assists and advises the Customs authorities in inspection of the consignments of flora & fauna as per the provisions of **Wildlife Protection Act, CITES and EXIM Policy** governing such an item.
- It coordinated "OPERATION THUNDER BIRD" (INTERPOL's multi-national and multi-species enforcement operation) in India.
- It has launched Operation wildnet counter the menace of the illegal trade through internet.

More about the News

- The award was given to **Wildlife Crime Control Bureau (WCCB)** for its efforts in conducting and coordinating a species-specific wildlife enforcement operation Kurma.

Operation Save Kurma

- It was conducted to combat the proliferating illegal trade in live **turtles** and its parts from the country to destinations abroad.

About Indian Turtles

- Turtles are listed in Schedule 1 of the The Wildlife Protection Act, 1972, Amendment 2002.
- Types of Indian turtles - Olive Ridley Turtles, Green Sea Turtle, Hawksbill Turtle, Leatherly Turtle, Eastern Mud Turtle
- **Loggerhead Turtle and Olive Ridley Turtle are listed as Endangered by IUCN (International Union of Conservation of Nature) while Leatherback Turtle is listed as critically endangered.**
- Government has recently decided to establish Turtle Sanctuary at Allahabad under **Namami Gange programme**.

3.6.5. TIGER CONSERVATION

Why in news?

- India, Nepal, Bhutan and Bangladesh have agreed to conduct a joint census of Tiger population.
- Orang tiger reserve has seen an increase in tiger density from 17 in 2013 to 28 tigers in 2017 during phase IV of the all-India tiger estimation programme.
- NTCA has approved relocation of 6 tigers to Buxa Tiger Reserve (BTR) in north Bengal from neighbouring Assam as part of a plan for augmentation of tiger population.

Tiger Population (High to low Population): Karnataka, Uttarakhand, Madhya Pradesh, Tamil Nadu, Assam, Kerala.

- The NTCA report on status of tigers, co-predators and prey in India, said the density in Kaziranga National Park was 12.72 per 100 sq. km., followed by Jim Corbett National Park (11) in Uttarakhand and Bandipur National Park (10.28) in Karnataka.

About the Joint Tiger Census

- Indian subcontinent is a home to about **80-90% of the tiger population of the world** with India being home to around **60% of global tiger population** (2500 tiger according to 2016 tiger census).
- Between the borders of India and Nepal there are contiguous national parks such as –
 - Parsa National park and Chitwan National Park in Nepal are connected with Balmiki National Park
 - Katarniaghat National Park in India is adjoined to Bardiya National Park
 - Dudwa National Park (India) is connected to Shuklaphant National Park in Nepal
- The authorities of participating nations will follow same protocol while conducting the census which will ensure avoiding chances of repeated counting of same tiger.

Initiatives for Tiger conservation

- Project Tiger** is an ongoing Centrally Sponsored Scheme of the Ministry of Environment, Forests and climate change (MoEFCC), providing central assistance to the tiger States for tiger conservation in designated tiger reserves, the implementing agency for this project is the National Tiger conservation authority.
- The NTCA is a statutory body of the MoEFCC, with an overarching supervisory / coordination role, performing functions as provided in the Wildlife (Protection) Act, 1972. It has the **responsibility of conducting the Tiger census every four years.**
- It has recently started using an app, called the **Monitoring System for Tiger-Intensive Protection and Ecological Status or M-STripES** developed by The **Wildlife Institute of India** (is an Autonomous Institution of the Ministry of Environment, Forest and Climate Change, Government of India). It also uses information technology for improved

surveillance (**e-Eye system**) using thermal cameras.

- IUCN** has specified tigers as **endangered in the Red List of Threatened Species**. There are three subspecies of Tigers which are extinct including Balinese tigers, Caspian tigers and Javan tigers.
- A first of its kind, Telangana State will have **eco-friendly bridges** over a canal cutting across the tiger corridor linking the Tadoba-Andhari Tiger Reserve in Maharashtra.
- The Integrated Tiger Habitat Conservation Programme (ITHCP)** is a strategic **funding mechanism** which aims to save tigers in the wild, their habitats and to support human populations in key locations **throughout Asia**.
 - It is supported by the German Government and the **German Development Bank (KfW)** and was launched in late 2014.
 - The programme contributes to the international goal set up during the **2010 St- Petersburg Tiger Summit to double wild tiger populations by 2022** (up to 6'000 tigers)
 - IUCN as the programme implementing agency.

The Terai Arc Landscape (TAL) is a 810 km stretch between the river Yamuna in the west and the river Bhagmati in the east, comprising the Shivalik hills, the adjoining bhabhar areas and the Terai flood plains.

- It is spread across Uttarakhand, Uttar Pradesh and Bihar, and the low-lying hills of Nepal. The landscape has most well-known Tiger Reserves and Protected Areas such as **Corbett Tiger Reserve, Rajaji National Park, Dudhwa Tiger Reserve, Valmiki Tiger Reserve** and Nepal's Bardia Wildlife Sanctuary, Chitwan National Park, and Sukhla Phanta Wildlife Sanctuary.
- These forests are home to three flagship species, the Bengal tiger (*Panthera tigris*), the greater one horned rhino and the Asian elephant.

3.6.6. ELEPHANT CENSUS

Why in news?

Recently, Ministry of Environment, Forest and Climate Change released an elephant census report, titled 'Synchronized Elephant Population Estimation India 2017'.

Elephant corridors: These are narrow strips of land that allow **elephants** to move from one habitat patch to another. There are approx. 100 identified **elephant corridors** in India.

Elephant in National Heritage animal of India.

Gaj Yatra is a nationwide campaign to protect elephants, launched on the occasion of World Elephant Day led by the Wildlife Trust of India (WTI).

Highlight

- **Decline in population:** There has been a decline in overall elephant population from 2012 to 2017 by 3000. This might be due to faulty counting method used in 2012.
- **Karnataka has the highest number of elephants** (6,049), followed by Assam (5,719) and Kerala (3,054)
- **Increase in the geographical range:** Elephants have been reported for the first time in Manipur, Mizoram, Bihar, Madhya Pradesh, Haryana, Himachal Pradesh and Andaman & Nicobar Islands.
- There have been increasing instances of the human-elephant conflict due to loss and degradation of wildlife habitats or climate change impacts like temperature and precipitation modification
- First time, **all-India synchronised elephant census** was carried out to avoid errors in estimation arising from the significant movement of elephants across different states.

International Initiative

Monitoring of Illegal Killing of Elephants (MIKE) Programme

- It was established in 2003, through a Conference of the Parties (COP) resolution to the **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)**.
- It is an international collaboration that tracks trends in information related to the illegal killing of elephants across Africa and Asia, to monitor effectiveness of field conservation efforts.
- **Purpose:** To provide information needed for elephant range States to make appropriate management and enforcement decisions, and to build institutional capacity within the range States for the long-term management of their elephant populations.

Steps Taken for Elephant conservation

Wildlife (Protection) Act, 1972:

- Under it, Elephant is a **Schedule I animal**.

IUCN Status: Asian elephants are listed as "endangered" in the IUCN Red List of threatened species.

Project Elephant:

- It was launched in the year 1992 as a **Centrally Sponsored Scheme**
- **Objectives:**
 - ✓ To protect elephants, their habitat & corridors
 - ✓ To address issues of man-animal conflict
 - ✓ Welfare of captive elephants
- **Elephant reserves** are established across states to achieve above objectives.

3.6.7. SPECIAL PROTECTION FORCE FOR ONE-HORNED RHINOS

Why in news?

The Assam government is going to raise a new Special Protection Force (SPF) for better protection of one-horned rhinos.

Greater One –horned Rhinos (Indian Rhino)

- They are mainly spread across **parts of India and Nepal**, with India being home to 2,200 rhinos, or **over 85 per cent of the population**.
- Rhinos in India today are found in **parts of Uttar Pradesh, West Bengal and Assam**.
- According to World Wildlife fund data of 2012, **Assam has 91 percent of total Rhino population of India** which is mainly concentrated in **Kaziranga National Park**, and a few in **Pobitora Wildlife Sanctuary and Manas national park**.
- The Indian rhinoceros is also known to help in seed dispersion, moving large tree seeds from forested areas to grasslands through excreta.
- The Indian rhino was moved from its status of endangered (since 1986) to **vulnerable in 2008** by the **International Union for Conservation of Nature (IUCN)**.

Indian Rhino Vision 2020

- Launched in 2005, Indian Rhino Vision 2020 is an ambitious effort to attain a wild population of at least 3,000 greater one-horned rhinos spread over seven protected areas in the Indian state of Assam by the year 2020.
- Indian Rhino Vision aims to **translocate Rhinos from Kaziranga National Park and Pobitora**

Wildlife Sanctuary to five other protected areas namely Manas, Laokhowa, Buracharpori-Kochmora, Dibrusaikhowa and Orang.

3.6.8. BLACKBUCK CONSERVATION RESERVE

Why in news?

- India's first **wildlife conservation reserve** dedicated exclusively to the **blackbuck** has been approved by the state government in the trans-Yamuna region of Allahabad in Uttar Pradesh under Wildlife Protection Act, 1972.
- It is the "**first ever conservation reserve**" of any kind in U.P.

Details

- Blackbucks, known for their majestic spiral horns and coat colour contrasts, are found in grasslands and open forests.
- They once inhabited the open savannahs of north and central India but are now restricted to just a few patches and habitats, primarily due to human population growth, ecosystem degradation and hunting.
- They are **native to the Indian subcontinent** that has been classified as **Least Concerned in 2017** (earlier status was **near threatened** by IUCN since 2003). They are now extinct in Bangladesh and Pakistan.
- There are a few national parks and sanctuaries inhabited by blackbuck in the country, like the **Velavadar Wildlife Sanctuary** in Gujarat and the **Ranibennur Blackbuck Sanctuary** in Karnataka. However, there are not many conservation reserves exclusively dedicated to it.
- Bishnoi community** is known as protectors of Blackbuck.

Bishnoi Community

- Followers of Bishnoism Started in 1485 AD by Saint Guru Jambheshwar
- They live in western Rajasthan and environment conservation is their cultural part.
- Amrita Devi** Bishnoi: Early Chipko Movement of 1730 AD. (Died protecting Khejri tree)
- Amrita Devi Bishnoi Wildlife Protection Award by Environment Ministry
- They do not cut trees. They only collect dead wood.
- Do not believe in rituals, idol-worship, and caste system.

3.6.9. CROCODILE CONSERVATION IN BHITARKANIKA

Why in news?

There has been a steady increase in sightings of salt water crocodile nests in the swampy creeks of the Bhitarkanika National Park on the Odisha coast.

About Bhitarkanika

- Bhitarkanika is a unique habitat of Mangrove Forests crisscrossed with numerous creeks and mud flats located in Kendrapara district of Orissa.
- It is located in the estuary of Brahmani, Baitarani, Dhamra & Mahanadi river systems.
- The wetland is represented by as many as 3 protected Areas, namely "The Bhitarkanika National Park", "The Bhitarkanika Wildlife Sanctuary" and "The Gahirmatha Marine Sanctuary".

More about the news

- Bhitarkanika is said to house 70% of India's estuarine or salt water crocodiles whose conservation started in 1975.
- Apart from this salt water crocodiles are also found in the Sundarbans in West Bengal, and in the large mangrove wetlands of the Andaman Islands which form a good nesting ground for them.
- In India there are three species of Crocodile i.e. **Gharial** (**Critically** endangered) which is unique to Indian subcontinent, **mugger** (Vulnerable) or marsh crocodiles and the **salt water** (Least concern) or estuarine crocodiles.

Crocodile Conservation and breeding project:

- It was launched initially in Orissa in 1975 and subsequently in other States with technical help from the Food and Agriculture Organisation (FAO) and the United Nations Development Programme (UNDP).
- Its strategy included protection of remaining population, rebuilding natural population, promotion of captive breeding, research and involvement of local people.
- Contrary to popular myths, crocodiles help in increasing the population of fish as they feed on predator fish e.g. Catfish that restricts growth of other fish.



3.6.10. CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS

Why in News?

- In the 12th session of the Conference of the Parties (CoP) to the CMS, several species of vultures, including four that have India on their migratory routes, were awarded the highest protection.

Convention on the Conservation of Migratory Species of Wild Animals (CMS) or Bonn convention

- It is the only global convention specializing in the conservation of migratory species, their habitats and migration routes
- It comes under the aegis of the **United Nations Environment Programme**.
- It provides a global platform for the conservation and sustainable use of migratory animals and their habitats.
- Appendix I of the Convention:** It includes Migratory species threatened with extinction
- Appendix II of the Convention:** It includes Migratory species that need or would significantly benefit from international co-operation.

Highlight of the conference

- Species of vulture which received highest protection under the convention (Appendix I) **are the red-headed vulture, white-rumped vulture, Indian vulture and slender-billed vulture.**
- Threat to vultures:** Vultures are faced with threats such as poisoning, hunting, collision with electricity cables and habitat degradation.
- Whale shark**, which inhabits the Indian Ocean, also got global protection which are on the verge of extinction due to over-fishing, vessel strikes etc
- Caspian seal** has also been identified for conservation. It is the only marine mammal found in the world's largest inland sea, where its migration is prompted by ice formation and foraging.
- It was also decided that **India will host 13th CMS COP.**

Vulture in India

- There are nine species of vultures in India out of which, 3 have been on **critically endangered list of IUCN** and also listed under **Schedule I of the Wild Life (Protection) Act, 1972**. These are:
 - White-backed Vulture (*Gyps bengalensis*)
 - Slender billed Vulture (*Gyps tenuirostris*)
 - Indian Vulture/long-billed vulture (*Gyps indicus*)

Note: Red-headed vulture is on **critically endangered list of IUCN** but not listed under **Schedule I of the Wild Life (Protection) Act, 1972**

- They are known as **Natural Sanitary Workers**, essential for environmental and ecological balance

Other Conservation steps

- Prohibition on usage of anti-inflammatory Diclofenac**, as it was found that the use of Diclofenac has caused steep decline in the population of vultures in the country.
- National Action Plan (2006) on Vulture Conservation:** The Action Plan provides for strategies, actions for containing the decline of vulture population through ex-situ, in-situ vulture conservation.
- Vulture Safe Zones (In-situ conservation initiative):** It is designated as natural habitat of wild vultures and is made free of the presence of the drug diclofenac in animal carcasses. It aims to protect and increase the remaining vulture populations and act as future release sites for the captive-bred vultures.
- Ramadevarabetta Vulture Sanctuary:** It is India's **only** vulture sanctuary in Karnataka
- 'Vulture Restaurants':** These spots are located strategically with a regular supply of safe food by collecting dead animals from local people for example in Punjab and Maharashtra.

3.6.11. IMPORTANT BIRD AND BIODIVERSITY AREAS

Why in News?

- Recently, BirdLife International has recognised three new sites in Goa and nine in Kerala as "Important Bird and Biodiversity Areas".

More on News

- Newly identified IBAs of Kerala: Achencoil Forest Division; Anamudi Shola National Park; Camel's Hump Mountain, Wayanad; Kurinjimala Wildlife Sanctuary; Malayattoor Reserve Forest; Mankulam Forest Division; Mathikettan Shola National Park;



Muthikulam-Siruvani; Pampadum Shola National Park

- In Goa: Bondla Wildlife Sanctuary, Navelim Wetlands and Netravali Wildlife Sanctuary.
- Kerala IBAs are home to **three critically endangered species (IUCN status)**
 - White-rumped Vulture
 - Indian Vulture
 - Red-headed Vulture
- Goa harbours a good population of the **lesser adjutant** and the **Nilgiri wood pigeon**.
- The updated list has been published by the **Bombay Natural History Society**
- Site under **Important Bird and Biodiversity Area** does not ensure that the site gets legal protection or becomes inaccessible to people.

Bird Life International

- UK based, environment conservation, Non-Profit Organisation
- Identifies: **Important Bird and Biodiversity Areas**
- Each BirdLife Partner is an independent environmental not-for-profit, or NGO.
- Publishes a quarterly magazine, **World Birdwatch**.
- Manage Red List of Birds for IUCN.

Bombay Natural History Society (BNHS)

- Non-governmental organization in India engaged in conservation research
- Collaborated with technology company **Accenture** to create **Internet of Birds**.
- Internet of Birds: **online tool** for birdwatchers that identifies birds based on their photos

Various reasons for Declining Birds Population

- Degraded level of **air quality** and water sources such as wetlands and ponds.
- **Noise levels** near urban areas of Manesar and other industrial locations.
- **Non-ionized microwave radiations** from mobile towers. Long-term exposure to low level Radio frequency radiation (RFR) has damaging effects on the nervous system, immune system and navigation capacity of birds.
- Combustion of **unleaded petrol** which produces compounds such as **methyl nitrite** which is highly toxic for insects that form a major part of young sparrow's diet.
- Widespread use of **garden pesticides**, vanishing open grasslands, rising air temperature.
- **Bird-unfriendly architecture** such as excess use of glass, paints and declining trend of making birds nesting place in houses.

3.6.12. ASIAN WATERFOWL CENSUS 2018

Why in news?

Recently, Asian Waterfowl Census was concluded in Coimbatore.

About the Asian Waterfowl Census

- It is an international program that was started in 1987 in the Indian Subcontinent.
- It is an integral part of **International Water Bird Census** and is coordinated by **Wetland International** (a global not-for-profit organisation working to sustain and restore wetlands and their resources for people and biodiversity).
- In India the AWC is jointly coordinated by the **Bombay Natural History Society** and **Wetland International**.

3.6.13. BIODIVERSITY HERITAGE SITES

Why in news?

Recently, Ameenpur Lake became the first water body in the country to be declared a Biodiversity Heritage Site.

Features

- It is located on the western fringes of Hyderabad in Telangana state.
- It is a man-made lake and was constructed during the reign of Ibrahim Qutab Shah, who ruled the kingdom of Golconda between 1550 and 1580.

Biodiversity Heritage Site (BHS)

- They are well defined areas that are unique, ecologically fragile ecosystems - terrestrial, coastal and inland waters and, marine having rich biodiversity comprising of any one or more of the following components:
 - Richness of wild as well as domesticated species or intra-specific categories.
 - High endemism,
 - Presence of rare and threatened species, keystone species, species of evolutionary significance,
 - Wild ancestors of domestic/ cultivated species or their varieties, past pre-eminence of biological components represented by fossil beds and
 - Having significant cultural, ethical or aesthetic values and are important for

the maintenance of cultural diversity, with or without a long history of human association with them.

- Under the Biological Diversity Act, 2002 (BDA) the **State Government in consultation with local bodies** notifies Biodiversity Heritage Sites (BHS).
- Further, the State Government in consultation with the Central Government may frame rules for the management and conservation of BHS.
- The State Governments shall frame schemes for compensating or rehabilitating any person or section of people economically affected by such notification.

Other Biodiversity heritage sites

Name	Region	Importance
Nallur Tamarind Grove	Bengaluru	It is popularly believed to be a relic of the Chola Dynasty.
Hogrekan	Chikmagalur	The area has unique Shola vegetation and grass land and has a link with adjoining Bhadra Wildlife Sanctuary and Yemmedode Tiger Reserve and serving as "Wildlife Corridor" between Kudremukha and Bhadra Wildlife Sanctuary.
University of Agricultural Sciences, GVKK Campus, Bengaluru	Bengaluru	The GVKK campus is considered one of the greenest areas in Bengaluru.
Ambaraguda	Shimoga	It is located between Sharavathi Wild Life Sanctuary and Someshwara Wildlife Sanctuary. It has Shola vegetation which is primitive vegetation in the Western Ghat and also has grasslands.
Glory of Allapalli	Gadchiroli (Maharashtra)	It is a reserved forest being preserved as natural forest having biological, ethnical and historical values.
Tonglu BHS under the Darjeeling Forest Division	Darjeeling (West Bengal))	It is a Medicinal Plant Conservation Areas

Dhotrey BHS under the Darjeeling Forest Division	Darjeeling (West Bengal)	It is a Medicinal Plant Conservation Areas
Dialong Village	Tamenglong (Manipur)	---

3.6.14. GANGA CONSERVATION

Why in News?

- Recently, Chital Committee formed by the government on Desiltation of the river Ganga, submitted its report.

Highlights

- It recommends a region-specific approach instead of a one-size-fits-all approach.
- **De-silting of the confluence points**, especially with huge silt carrying tributaries, such as Ghagra, Sone, etc., may be necessary to make confluence hydraulically efficient.
- The Ganga Flood Control Commission should be entrusted with additional mandate to carry out necessary studies on sediment management in river Ganga.

Other conservation efforts

- Environment protection act 1986 envisages five tier structures at national, state and district level to take measures for prevention, control and abatement of environmental pollution in river Ganga and to ensure continuous adequate flow of water so as to rejuvenate the river Ganga as below;
 - National Ganga Council under chairmanship of Prime Minister of India (It replaced National Ganga River basin authority).
 - Empowered Task Force (ETF) on river Ganga under chairmanship of Union Minister of Water Resources, River Development and Ganga Rejuvenation.
 - **National Mission for Clean Ganga(NMCG)** which will have a two-tier structure with a Governing Council and an Executive Committee. The NMCG will comply to the decisions of the National Ganga Council.
- ✓ The NMCG will now have the power to issue orders and also exercise the powers under the Environment

Protection Act. It can now fine polluters.

- ✓ NMCG will only take action in case of non-compliance when CPCB (Central Pollution Control Board) does not do so.
- ✓ CPCB can also take action jointly with NMCG.
- ✓ A comprehensive River Basin Management Plan for Ganga is being prepared by the consortium of seven Indian Institutes of Technology (IITs) for restoration of the wholesomeness of the Ganga ecosystem and improvement of its ecological health, with due regard to the issue of competing water uses in the river basin.
- ✓ The wholesomeness of the river can be grasped in terms of four defining concepts: "Aviral Dhara" (Continuous Flow), "Nirmal Dhara" ("Unpolluted Flow"), Geologic Entity, and Ecological Entity.
- State Ganga Committees and
- District Ganga Committees in every specified district abutting river Ganga and its tributaries in the states.

Ganga Flood Control Commission (1972)

- It is a sub-ordinate office of Ministry of Water Resources, River Development and Ganga Rejuvenation.
- It acts as the secretariat and executive wing of Ganga Flood Control Board, headed by Union Minister of Water Resources, River Development and Ganga Rejuvenation with the Chief Ministers of Ganga river basin States and Member, NITI Aayog.

'Namami Gange Programme': It is an Integrated Conservation Mission under NMCG, with budget outlay of Rs. 20,000 Crore to accomplish the twin objectives of effective abatement of pollution, conservation and rejuvenation of National River Ganga. Main pillars of the Namami Gange Programme are: -

- Sewerage Treatment Infrastructure
- River-Front Development
- River-Surface Cleaning
- Bio-Diversity
- Afforestation
- Public Awareness
- Industrial Effluent Monitoring
- Initiatives under Namami Gange

- **Ganga Gram Yojana:** 1600 villages situated along the banks of river Ganga will be developed under this scheme. In these villages open drains falling into river Ganga will be diverted and alternative arrangements for sewage treatment will be made. It has the following objectives:

- ✓ Strengthening grass root involvement of all stakeholders including Panchayati Raj institutions and local bodies
- ✓ Encouraging the adoption/utilization of traditional knowledge
- ✓ To utilize sector level expertise from different levels in government, NGOs, citizens etc.
- ✓ Enhancing livelihood security through water security in rural areas.
- ✓ The villages will have toilets in every household.
- ✓ These villages will be developed under the Sicheval model (where cooperation of the villagers has been solicited for the water management and waste disposal).

- Ganga Task Force has been approved by the Cabinet under the Public Participation component of the Namami Gange Programme.
- ✓ 4 Battalions of Composite Eco Task Force (CETF) named as Ganga Task Force will be raised. Out of which one battalion (ex-servicemen) will be from Territorial Army (TA)
- ✓ Jawans of the GTF will be deployed on the banks of Ganga to ensure that industry and civilians do not pollute the river.

Swachh Yug Campaign

- As part of its efforts to make villages located along Ganga open defecation-free, Government has launched a campaign 'Swachh Yug'.
- It is a collaborative effort of three Union Ministries (The Ministry of Drinking Water and Sanitation; Ministry of Youth Affairs and Sports; Ministry of Water Resources, River Development and Ganga Rejuvenation) to bring about behavioural change among people staying in villages along the river.
- There are 5,169 villages located along Ganga in five states- UP, Uttarakhand, Bihar,

Jharkhand and West Bengal, out of which 4480 villages are now open defecation free.

3.6.15. DOUBLING OF PROTECTED AREAS

Why in news?

- MoEFCC is considering doubling the number of protected areas such as national parks and wildlife sanctuaries.

Present status

- At present protected areas are 729 in number & cover 4.9% or 162,072 sq. km of India's geographical area.
- About 0.3% of EEZ (exclusive economic zone) is under Marine Protected Areas (MPA) in India.
- India's network of protected areas is far below the "Aichi Target".

Aichi biodiversity targets

- They are a series of goals that were set in 2010 at a Conference of Parties to the Convention on Biological Diversity meeting for protection and conservation of biodiversity.
- Target 11:** By 2020, at least 17% of terrestrial & inland water, and 10% of coastal & marine areas, are conserved through systems of protected areas and other effective area-based conservation measures.

Protected Area Network in India: provided under Wildlife (Protection) Act, 1972

- Sanctuary** is an area which is of adequate ecological, faunal, floral, geomorphological, natural or zoological significance. It is declared for the purpose of protecting, propagating or developing wildlife or its environment. In Wildlife sanctuaries harvesting timbers, cultivation, collection of forest products are allowed with permission.
- The National Park** is like that of a Sanctuary. The rights of the people living inside these protected areas are tightly regulated and activities like grazing, hunting, forestry or cultivation, encroachment, destruction of habitats and other activities are strictly prohibited. But most national parks provide outdoor recreation, camping opportunities and are designed to educate the public on the importance of conservation activities.
- Conservation Reserves** can be declared by the State Governments in any area owned by the Government, particularly the areas

adjacent to National Parks and Sanctuaries and those areas which link one Protected Area with another. The rights of people living inside a Conservation Reserve are not affected.

- Community Reserves** can be declared by the State Government in any private or community land, not comprised within a National Park, Sanctuary or a Conservation Reserve, where an individual or a community has volunteered to conserve wildlife and its habitat. The rights of people living inside a Community Reserve are not affected.

3.6.16. NEW WETLAND CONSERVATION RULES

Why in News?

- Recently, Central government notified **Wetlands (Conservation and Management) Rules, 2017**.

Background

- According to a **Centre for Science and Environment report**, the loss of wetlands has been linked to more frequent urban flooding events, as witnessed in Mumbai and Chennai.
- According to key **United Nations finding**, the wetlands -- marshes, swamps, bogs, large or small lakes, and ponds -- are being lost more rapidly than any other kind of ecosystem due to encroachment and rapid urbanization.
- They support rich biodiversity and provide wide range of ecosystem services such as water storage, water purification, flood mitigation, erosion control, aquifer recharge, act as carbon sinks and others.

Provision under the new rules

- Definition of wetlands:** They are defined as "an area of marsh, fen, peatland or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.
- Decentralisation of Power:** Under the new rules, the central government has empowered the states and union territories to identify and manage their wetlands.
- Constitute State Wetlands Authority** in each State and union territories that will be headed by the State's environment minister and include a range of government officials.

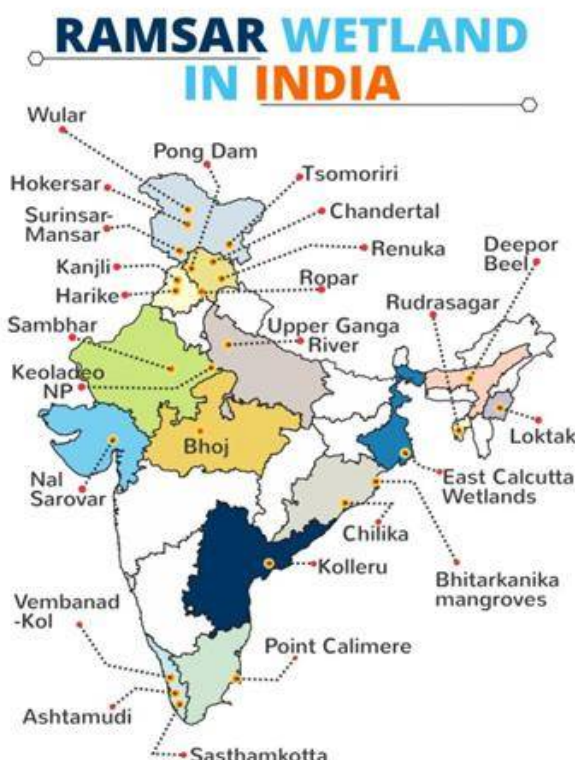
They will prepare a list of all wetlands of the State or union territory within three months.

- **Setting Up National Wetlands Committee:** it will replace Central Wetlands Regulatory Authority (CWRA), to monitor implementation of these rules and advise the Central Government on appropriate policies and action programmes for conservation and wise use of wetlands
- **Banned activities:** Certain activities are banned in notified wetland like setting up of industries, dumping of solid, electronic, hazardous and construction wastes, poaching of animals, conversion of wetland area into non-wetland purposes, encroachment and even construction of any permanent structure will also be banned at the notified wetlands.
- **Applicability of rules:** These rules shall apply to the following wetlands or wetlands complexes, namely:
 - Wetlands categorised as 'wetlands of international importance' under the Ramsar Convention
 - Wetlands as notified by the Central Government, State Government and Union Territory Administration.

Ramsar Convention on Wetland

- The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an international intergovernmental treaty for conservation of wetlands. **India is a party to the treaty.**
- It provides framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.
- **Major obligations of countries which are party to the Convention are:**
 - Designate wetlands for inclusion in the List of Wetlands of International Importance.
 - Promote, as far as possible, the wise use of wetlands in their territory.
 - Promote international cooperation especially with regard to transboundary wetlands, shared water systems, and shared species.
 - Create wetland reserves.
- World Wetland Day is observed every year on 2nd February. This day marks the adoption of **Ramsar Convention on Wetlands**. The theme of 2018 is **"Wetlands for a Sustainable Urban Future"**.

- The **Montreux Record** is a register of wetland sites on the List of Wetlands of International Importance where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference. It is maintained as part of the Ramsar List. Currently, two wetlands of India are in Montreux record, **Keoladeo National Park**, Rajasthan and **Loktak Lake**, Manipur. Further, **Chilka lake** was placed in the record but was later removed from it.



National Plan for Conservation of Aquatic Ecosystems (NPCA)

- For conservation of lakes and wetlands, Ministry of Environment and Forests has been implementing two separate Centrally Sponsored Schemes (CSS), namely the **National Wetlands Conservation Programme (NWCP)** and the **National Lake Conservation Plan (NLCP)**.
- **Objective of NPCA** are conserving aquatic ecosystems (lakes and wetlands) through implementation of sustainable Conservation Plans and governed with application of uniform policy and guidelines.

3.6.17. NEW GUIDELINES ON COMPENSATORY AFFORESTATION

Why in news?

- Recently, Ministry of Environment, Forest and Climate Change (MoEF&CC) **issued guidelines** specifying criteria for suitability and identification of land bank for compensatory afforestation (CA).

Compensatory afforestation

- It refers to the afforestation and regeneration activities carried out as a way of compensating for forest land which is diverted to non-forest purposes.
- The Forest (Conservation) Act, 1980** provide that whenever a forest land is to be diverted for non-forestry purposes, the equivalent non-forest land has to be identified for compensatory afforestation and funds for raising compensatory afforestation are to be imposed.
- The act further requires that:
 - the non-forest land for CA are to be identified contiguous to or in the proximity of Reserved Forest or Protected Forest, as far as possible.
 - in case, non-forest land for CA is not available in the same district, non-forest land for CA is to be identified anywhere else in the State/Union Territory.
 - If non-forest land is unavailable in the entire State/ UT, funds for raising CA in double the area in extent of the forest land diverted need to be provided by the user agency on the basis of the rates fixed by the State Forest Department.

Compensatory Afforestation Fund Act 2016

- It established National Compensatory Afforestation Fund (NCAF) under the public account of India and State Compensatory Afforestation Funds under public accounts of states.
- These funds will receive payments for:
 - compensatory afforestation,
 - net present value of forest (NPV),
 - Other project specific payments.
- The National Fund will receive 10% of these funds, and the State Funds will receive the remaining 90%.
- The funds will be **non-lapsable** and interest bearing by the rate decided by central government on a yearly basis.
- Act provides statutory status for two ad-hoc institution, namely;

- National Compensatory Afforestation Fund Management and Planning Authority (CAMPA)** for management and utilisation of NCAF.
- State Compensatory Afforestation Fund Management and Planning Authority for utilisation of State Compensatory Afforestation Fund.
- The act also seeks to provide for constitution of a multi-disciplinary monitoring group to monitor activities undertaken from these funds.
- The act also provides for annual audit of the accounts by the Comptroller and Auditor General.
- e-Green Watch** has been developed for online monitoring of various afforestation works being carried out using CAMPA funds.

New Guidelines

- It mandates that states and UTs shall create land bank for CA for speedy disposal of the forest clearance proposals under FC Act 1980.
- The states shall also set up committee with principal chief conservator of forests, chief wildlife warden and representatives of revenue department for expediting creation of land banks in a systematic manner.
- The state governments shall formulate CA scheme including activities like soil and moisture conservation, regeneration cleaning, silvicultural activities and shall ensure maintenance of these plantations for a period of seven to 10 years as per requirement.
- It stipulates that for CA the number of plants to be planted over CA land shall be at least 1,000 plants per hectare of forest land diverted. However, if 1,000 plants cannot be planted on the non-forest land identified for CA, then the balance will be planted in degraded forest land.

Ministry of Environment, Forests and Climate Change (MoEF&CC) has also come up with new guidelines for **diversion of forest land**.

- These comprise a number of **new costs for diversion** of forest land, including possession costs, habitat fragmentation costs and various ecological services cost like water recharge, nutrients in the soil, carbon sequestration and others.

- NPV [NET PRESENT VALUE]** formula will be used to assess the ecosystem service cost of diversion.

Net Present value [NPV] of forest

- It is defined under **Forest (Conservation) Act of 1980**.

- It is the **amount paid by the project proponent** for diverting land for non-forest use to compensate the loss in ecosystem services.
- It is calculated for a **period of 50 years**.
- For **NPV estimation** forests are **categorised into six eco-classes, or forest types, and three canopy cover density classes**—very dense forest, moderately dense forest and open forest.

3.6.18. THREAT TO SACRED GROVES

Why in News?

- A recent study conducted by Central University of Kerala found out the correlation between rapid urbanisation, invasive species and decreasing sacred groves.

Highlights

- Increasing urbanisation leads to waste generation which attracts various invasive species.
- These invasive species in the vicinity damage the crop, prey on beneficial insects, crabs and native species.
- Maharashtra accounts for highest number of sacred grove followed by Karnataka.
- There is **no specific action programme** for protection of sacred grove.

What are Sacred Groves?

- Patches of natural vegetation dedicated to local deities or tree spirits.
- No hunting and logging, protected by local communities (tribes).
- Annual processional festival to re-establish the mystic bonds between the goddess and the people.

Ecological Significance: Conservation of Biodiversity, recharge of aquifer, Soil Conservation, valuable medicinal plants.

Some of the important sacred groves are: Kavu, Sara Kavu in Kerala, Kovil Kadu in Puducherry, Pavithravana in Andhra Pradesh, swami shola in Tamil Nadu etc.

3.6.19. GREEN SKILL DEVELOPMENT PROGRAMME

Why in news?

The government is expanding the Green Skill Development Programme (GSDP) to an all-India level.

Green Skills: Green skills are those skills needed to adapt products, services and processes to climate change and the related environmental requirements and regulations. They include the knowledge, abilities, values and attitudes needed to live in, develop and

support a sustainable and resource-efficient society. (OECD definition)

These skills are required in areas such as such as Renewable energy, Waste water treatment, Climate resilient cities, Green construction, Solid waste management etc.

More on news

- Utilising the vast network and expertise of ENVIS Hubs/RPs, the Ministry of Environment, Forests & Climate Change (MoEF&CC) has taken up an initiative for skill development in the environment and forest sector to enable India's youth to get gainful employment and/or self-employment, called the **Green Skill Development Programme (GSDP)**.
- After a pilot project in 2017, now ministry has taken following steps to expand it:
 - **Increased budget allocation** for ENVIS in budget 2018-19 by 33%. Out of this, the training courses under GSDP will be funded.
 - **Increased target:** A total of 5 lakh 60 thousand people will be imparted training between 2018-19 and 2020-21.
 - **More green skills now:** The government has identified 35 courses including pollution monitoring (air/water/noise /soil), effluent treatment plant operation, forest management, water budgeting etc.

Environmental Information System (ENVIS)

- It is a central sector scheme, being implemented by MoEF&CC since 1982-83.
- It is a decentralized network of centres of which
 - Some centres dealing with "State of the Environment and Related Issues" are hosted by State Government /UT Administrations, called **ENVIS Hubs**
 - Some are hosted by environment-related governmental and non-governmental organisations/ institutes of professional excellence, with varied thematic mandates pertaining to environment, called the **ENVIS Resource Partners (RPs)**.

3.6.20. SCHEME FOR PROTECTION OF MAJULI ISLAND

Why in news?

Government has unveiled a scheme for protection of Majuli Island in Assam from flood and erosion from river Brahmaputra.

Majuli Island

- It is the largest inhabited river Island in the world and India's first island district.
- It is surrounded by the Brahmaputra River on the south, KherkatiaSuti, LuitSuti and Subansiri Rivers on the North.
- It is the nerve centre of neo-Vaishnavite culture.
- It is home to a mix of communities – the Mishing tribe, the Deoris, the Sonowalkacharis and the Ahoms.

Details of Scheme

- It is being implemented by the Brahmaputra Board under ministry of water resources and will be funded by Ministry for development of North Eastern region.
- Majuli island is a part of the **alluvial flood plains** of the Brahmaputra river.
- The Island is formed of soil consisting mainly of **silt deposits**. The soil is without cohesion and thus, **susceptible** to both floods and erosion almost every year.
- Problem of erosion has been more severe after **the disastrous earthquake of 1950**. However, some **reclamation steps** are being taken up by Brahmaputra Board.

3.6.21. DEEP SEA TRAWLING

Why in news?

Sri Lankan Parliament passed amendment to Fisheries and Aquatic Resources Act, which will ban trawling in Palk Bay and imposes a fine of 50,000 Sri Lankan Rupees for violations.

Background

- **Deep sea trawling** refers to a practice in which fishing nets are **trawled or dragged along the sea floor** specifically to catch the seafloor animals such as shrimps, cod, sole and flounder.
- This practice is mainly used for **commercial fishing** to maximise the fish catch in temperate regions.

Challenges and threats due to Deep Sea Trawling

- **Bottom Trawling** or Deep-Sea Trawling is unselective and severely damages the seafloor ecosystem.
- It is harmful to **marine diversity in Tropical waters** where the species diversity is high as compared to number of each species i.e. their population.

- Deep Sea Trawling also increases the plastic debris due to wear and tear of the nets, buoys and other equipment.

3.6.22. PROJECT 'BLUE FLAG' FOR BEACH CLEAN-UP

Why in news?

The environment ministry has launched a pilot project 'Blue Flag' for beach clean-up and development.

Details

Under the project, each state or union territory has been asked to nominate a beach which will be funded through the ongoing **Integrated Coastal Zone Management (ICZM) Programme**.

- The prime objective is enhancing standards of cleanliness, upkeep and basic amenities at beaches.
- The govt is also striving for the 'Blue Flag' certification for such identified beaches. The 'Blue Flag' is a certification by the Foundation for Environmental Education (FEE) that a beach or sustainable boating tourism operator meets its stringent standards.

The MoEFCC had launched an Integrated Coastal Zone Management Project by establishing a Society of Integrated Coastal Management (SICOM). Under the project, SICOM would be implementing the four components, namely,

- National Coastal Management Programme;
- ICZM-West Bengal;
- ICZM-Orissa;
- ICZM-Gujarat.

Foundation for Environmental Education (FEE)

- The FEE is a non-governmental, non-profit organisation promoting sustainable development through environmental education. It was established in 1981.
- It is active through five programmes; Eco-Schools, Blue Flag, Young Reporters for Environment (YRE), Green Key and Learning about Forests (LEAF).
- India is represented by **Centre for Environment Education, Gujarat**.
- It has established the **Global Forest Fund** to offset CO2 emissions from travel. The fund invests 90% of its income directly into tree planting and other CO2 compensation efforts that are combined with environmental education activities.



3.6.23. FLOATING TREATMENT WETLAND

Why in news?

Recently, Floating Treatment Wetland (FTW) on Nekkampur Lake in Hyderabad was inaugurated on World Wetlands Day.

What are FTWs?

- FTWs are **buoyant structures** or rafts of **wetland vegetation** that are deployed in water bodies such as ponds and lakes with **permanent pool of water**.
- These plants are **perennial non-invasive emergent plants** which mimic the functions of natural wetlands.
- However, in contrast to the traditional wetlands the roots of the plants do not take root in soil however they **stay suspended in water column** in order to allow plants to **adjust to the water fluctuations** without any harm.
- Various plants grown on FTW are vetivers, canna, cattails, bulrush, citronella, hibiscus,

fountain grass, flowering herbs, tulsi and ashwagandha.

- Significance –
 - Help to purify the lake by **breaking down and consuming the organic matter** in water with the help of **micro-organisms growing in the plant root system** of FTW through microbial decomposition
 - Reduce the **biochemical oxygen demand (BOD)** of the lake
 - **Reduce the growth of algae** by restricting sun rays seeping into the lake
 - Improve the **biodiversity** of the lake
- The Nekkampur plant, based on the **soil-less hydroponic technique**, has been recognised by the **India Book of Records** as the largest FTW in the country.

Hydroponics

It is a subset of hydroculture, which means growing of plants in a soil less medium or in an aquatic based environment.

It uses minerals and nutrients present in solution to feed the plants in water without soil. Thus, plants grow only on sunlight and water.



4. SUSTAINABLE DEVELOPMENT

4.1. GREEN BUILDING RATING SYSTEM

Why in news?

To promote construction of environment-friendly buildings, Rajasthan government has adopted the green building rating system developed by the Indian Green Building Council (IGBC), which is part of the Confederation of Indian Industry (CII).

Indian Green Building Council (IGBC)

- The vision of the council is, "To enable a sustainable built environment for all and facilitate India to be one of the global leaders in the sustainable built environment by 2025".
- It also organises **Green Building Congress**, its annual flagship event on green buildings.
- All the stakeholders of construction industry comprising of architects, developers, product manufacturers, corporate, Government, academia and nodal agencies participate in the council activities through local chapters.

Other initiatives for Green building rating in India

Green Rating for Integrated Habitat Assessment (GRIHA)

- Developed by **TERI (The Energy and Resources Institute)** and the **Ministry of New and Renewable Energy**.
- Rating criteria (1) Site selection and site planning, (2) Conservation and efficient utilization of resources, (3) Building operation and maintenance, and (4) Innovation.

Conventional Methods of Green building

- Homes with baked red colour roof tiles and clay.
- Rural India use of naturally available materials like clay, wood, jute ropes, etc.

Energy Conservation Building Code-2017

- It was developed by Bureau of Energy Efficiency (Statutory body under Ministry of Power) with technical support from United States Agency for International Development (USAID) under US-India bilateral Partnership to Advance Clean Energy – Deployment Technical Assistance (PACE-DTA) Program.

- In order for a building to be considered ECBC-compliant, it would need to demonstrate minimum energy savings of 25%.
- Additional improvements in energy efficiency performance would achieve higher grades like ECBC Plus or Super ECBC status leading to further energy savings of 35% and 50%, respectively.
- They are voluntary in nature and have been accepted by 22 states with their own modifications to the codes.
- BEE has also developed Energy Performance Index which rates buildings on a scale of 1 to 5 stars.
- BEE has also launched ECO-NIWAS (Energy Conservation– New Indian Way for Affordable & Sustainable homes) portal for increasing awareness about sustainable building and energy efficient homes in the country.

4.2. LEED FOR CITIES

Why in news?

The **LEED for Cities** and **LEED for Communities** frameworks recently completed one year in December, 2017.

LEED (Leadership in Energy and Environmental Design)

- It is an international certification run by U.S. Green Building Council (USGBC), which **provides a framework to building owners and operators** for identifying and implementing **practical green building solutions**.
- It concentrates its efforts on improving performance across **five key areas** of environmental and human health: **energy efficiency, indoor environmental quality, materials selection, sustainable site development and water savings**.

About LEED for Cities and LEED for Communities

- These are **expansion of LEED** designed to be applicable to cities, communities, neighbourhoods, districts, townships and counties.
- These will track performance on energy use, waste management, water, transport and even quality of life.

- These frameworks **require a community or a city to set goals** and implement strategies and plans to maintain and support these goals.
- The city or community then uses an online platform to share performance data to measure and track progress toward those goals, thus focusing on outcomes rather than pledges.
- For certification, projects will track and report key metrics across **five categories**-Energy, Water, Waste, Transportation and Human experience including Education, Prosperity, Equitability, and Health & Safety.

4.3. ELECTRIC VEHICLE

Why in news

Recently, SIAM (Society of Indian Automobile Manufacturers) released a White Paper on Electric Vehicles.

Government initiatives for Electric Vehicles (EV)

- **India's Electric Vehicle (EV) Mission 2030:** Government plans to have an all-electric fleet of vehicles by 2030.
- **National Electric Mobility Mission:**
 - It aims to achieve **national fuel security** by promoting hybrid and electric vehicles in the country.
 - It targets 6-7 million sales of hybrid and electric vehicles year on year from 2020 onwards.
- **FAME-India (Faster Adoption and Manufacturing of (hybrid &) Electric vehicles in India) scheme:** To support the hybrid/electric vehicles market development and its manufacturing eco-system to achieve self-sustenance by subsidizing electric vehicle purchases on an annual basis.
 - Scheme is proposed to be implemented till 2020.
 - The scheme has four focus areas viz. **technology development, demand creation, pilot projects and charging infrastructure.**
- **Automotive Mission Plan 2026:** It aimed at bringing the Indian Automotive Industry among the top three of the world in engineering, manufacture and exports of vehicles & components; growing in value to over 12% of India GDP and generating an additional 65 million jobs.
- **Green Urban Transport Scheme**
 - It focused to reduce the emission of harmful carbon gas from the transportation, especially from government owned transport facilities.
 - Under this scheme, government plans to

launch the eco-friendly transportation facilities in urban areas across the nation which run without damaging climatic conditions.

Other Steps taken by government

- EVs are levied with 12% GST and no cess, versus 43% tax for luxury vehicles and hybrid vehicles.
- It allowed electric vehicles (EVs) for commercial purposes **without any permit.**
- It directed state-owned power utilities to set up **fast-charging station.**
- Country's first **multi-modal electric vehicle project** was recently launched in Nagpur for public transport.

4.4. GUIDELINE FOR GROUND WATER USAGES BY INDUSTRY

Why in news?

- Central Ground Water Authority (CGWA) proposed the new guidelines for ground water usages by industry, mining and infrastructure dewatering projects.

Background

- 89% of ground water extracted is used in irrigation sector followed by domestic use (9%), industrial use (2%).
- 50% of urban water requirements and 85% of rural domestic water requirements are also fulfilled by ground water.

Legislative and Policy Framework

- Water falls under the **State List** of the Constitution. However, the central government can legislate on environmental matters including promotion of groundwater protection and promotion of sustainable use.
- **The Environment (Protection) Act, 1986** for the purpose of regulation and control of ground water development and management.
- **Groundwater Bill 2017** takes a decentralized approach and seeks to give regulatory control of groundwater bodies to local bodies.
- **National Water Policy 2012** suggested key principles relating to demand management, usage efficiencies, and infrastructure and pricing aspects of water.
- **The new guidelines** call for a uniform regulatory framework, levy of water conservation fee etc.
- **National Project on Aquifer Management (NAQUIM)** an initiative of the Ministry of

Water Resources, has been launched for mapping and managing the entire aquifer systems in the country with an aim to enhance the capacity of states in Ground Water Management and Development.

Central Ground Water Authority

- Statutory body under Ministry of Water Resources, River Development and Ganga Rejuvenation
- Mandate under the Environment (Protection) Act, 1986 to regulate and control development and management of ground water resources in the country.

4.5. ENVIRONMENT IMPACT ASSESSMENT

Why in News?

- Government has issued a draft notification to amend the Environment Impact Assessment (EIA) notification, 2006, which increases the ambit of **state government authorities** to grant environmental clearances (ECs) particularly related to mining projects involving non-coal minerals and minor minerals, as well as river valley/irrigation projects.

About Environment Impact Assessment (EIA)

- It is a tool used to identify the environmental, social and economic impacts of a project prior to decision-making (**United Nation Education Programme**).
- It is notified under the **Environment (Protection) Act 1986**.
- EIA for **Category A** project requires clearance by **Environment Ministry** and for category B project **State Environment Impact Assessment Authority (SEIAA)** clearance is required.
- **Process for EIA**



Strategic environment assessment (SEA)

- It is the process by which environmental considerations are required to be fully integrated into the preparation of Plans and Programmes and prior to their final adoption.
- SEA represents a proactive approach to integrating environmental considerations into the higher levels of decision-making.

4.6. SUSTAINABLE TOURISM

Why in news?

Sustainable tourism was the theme of **World Biodiversity Day 2017**.

About sustainable tourism

- Sustainable tourism is defined as "tourism that respects both local people and the traveler, cultural heritage and the environment".
- It seeks to provide people with an exciting and educational holiday that is also of benefit to the people of the host country.

India and sustainable tourism

- Ministry of Tourism has launched the Implementation of the Sustainable Tourism Criteria for India (STCI) in association with Ecotourism Society of India (ESOI)
- STCI had been developed for the accommodation, tour operators and beaches, backwaters and lakes sectors of the tourism industry.
- The STCI follow the guidelines set by the Global Sustainable Tourism Criteria (GSTC) that has been evolved under the guidance of the United Nations' agencies viz. UNEP and UNWTO.

4.7. MANGALAJODI ECOTOURISM TRUST

Why in News?

Mangalajodi Ecotourism Trust (MET) has recently won the United Nations World Tourism Organisation (UNWTO) Awards for "**Innovation in Tourism Enterprise**".

About Ecotourism

- It is defined as "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education".



More about the News

- Mangalajodi is a village located on the northern banks of **Chilika Lake in Odisha**.
- Due to coordinated efforts by the community the number of migratory birds in the region has been restored since 2000.
- MET is a community owned and managed wildlife conservation venture promoted by RBS Foundation India and Indian Grameen Services.

About UNWTO

- Established in 1975, it is the United Nations agency responsible for the promotion of responsible, sustainable and universally accessible tourism.
- It includes members representing the private sector, educational institutions, tourism associations and local tourism authorities. Its headquarters are located in Madrid.
- India is a member of UNWTO since 1975.
- **UNWTO Awards for Innovation in Tourism** are given to innovative tourism initiatives which are both competitive and sustainable in their character.

4.8. PERMACULTURE

Why in news?

Recently the 13th International Permaculture Convergence (IPC) was held in Hyderabad.

About IPC

- First IPC was hosted in Australia in 1984. These events have been serving as a platform to discuss strategy, education standard, research, and regional and global permaculture developments.

What is permaculture?

- It is the conscious design and maintenance of agriculturally productive ecosystems which have the diversity, stability, and resilience of natural ecosystems.
- It is the harmonious integration of landscape and people — providing their food, energy, shelter, and other material and non-material needs in a sustainable way.
- The term was coined by Bill Mollison in 1978.

Significance of permaculture

- **Environment friendly:** It discourages uses of chemical and pesticide and promotes the uses of eco-friendly means to maintain soil health and increase productivity.
- **Decrease Global warming:** Increasing area under permaculture from current 108 million

acres to 1 billion acres by 2050 could result in a total reduction of 23.2 gigatons of CO₂, from both sequestration and reduced emissions.

- **Promotion of Traditional practice:** It incorporates traditional farming practices with modern technological and scientific knowledge to create efficient systems. It can also reduce the dependency of farmers on multi-national companies for genetically modified seeds.
- **Improve income:** Instead of monoculture, permaculture uses polyculture where a diverse range of vegetation and animals are utilised to support each other to create a self-sustaining system.

4.9. ZERO BUDGET NATURAL FARMING

Why in news?

In a first of its kind move, Andhra Pradesh government is supporting Zero Budget Natural Farming (ZBNF) through self-help groups to improve livelihood of farmers and fight climate change in drought-prone regions.

Zero Budget Natural Farming

- It is a natural farming technique developed by **Subhash Palekar** in which farming is done without use of chemicals and without using any credits or spending any money on purchased inputs.
- ZBNF reduces the cost of production down to zero due to utilisation of all the natural resources available in and around the crops. Farmers use earthworms, cow dung, urine, plants, human excreta and other biological fertilizers for crop protection.
- Under this **inter-cropping** is practised where, combination of various crops is grown simultaneously to produce greater yield on given piece of land by making use of resources that may be utilised by single crop.
- **Contours and bunds** to preserve rain water as it promotes maximum efficacy for different crops.
- ZBNF also includes **replenishing water bodies** such as farm ponds to ensure water availability during dry spells.



4.10. DEVELOPMENT OF SOLAR CITIES

Why in news?

The Ministry of New and Renewable Energy under its scheme “Development of Solar Cities” has approved/sanctioned 60 Cities up to 12th Five-year Plan period.

About Solar cities

- The Solar City aims at minimum 10% reduction in projected demand of conventional energy at the end of five years.
- It uses a combination of enhancing supply from renewable energy sources in the city and energy efficiency measures.
- The aim is to motivate the local Governments for adopting renewable energy technologies and energy efficiency measures.

4.11. GOBARDHAN YOJANA

Why in news?

- The Gobardhan Yojana, announced in the Budget 2018-19, has been launched by the Haryana Government.

About Gobardhan (Galvanising Organic Bio-Agro Resources Dhan) Yojana

- It would be implemented under **Swachh Bharat Mission-Gramin** with twin objectives - To make villages clean and generate wealth and energy from cattle and other waste.
- It would focus on managing and converting cattle dung and solid waste in farms to compost, biogas and bio-CNG.

- An online trading platform will also be created to connect farmers to buyers so that they can get the right price for cow dung and agricultural waste.
- The challenge is to incentivise farmers to think of their cattle waste as a source of income and, in the process, also keep their communities swachh.

Swachh Bharat Mission-Gramin

- It is under the Ministry of Drinking water and Sanitation
- The aim of Swachh Bharat Mission (Gramin) is to achieve a clean and Open Defecation Free (ODF) India by 2nd October, 2019.

Need

- The 19th Livestock Census (2012) estimates India's cattle population at 300 million (highest in the world), putting the production of dung at about 3 million tonnes per day.
- According to a 2014 ILO study, the productive use of dung could support 1.5 million jobs nationally. For the farmer, there is a significant potential of greater income from the sale of cow dung.
- The ILO study also reports that the value of one kg of cow dung multiplies over 10 times, depending on whether the end product is fresh dung (sale price of Rs 0.13) or as input for a one-megawatt biogas plant along with compost output (Rs 1.6).
- **Biogas** is characterized based on its chemical composition and the physical characteristics which result from it. It is primarily a mixture of methane (CH₄) and inert carbonic gas (CO₂). Different sources of production lead to different specific compositions. The presence of H₂S, of CO₂ and water make biogas very corrosive and require the use of adapted materials.
- **Bio CNG** is the purified form of Biogas where all the unwanted gases are removed to produce >95% pure methane gas. **Bio CNG** is exactly similar to the commercially available natural gas (which is non-renewable) in its **composition** and energy potential.

4.12. COMBUSTIBLE ICE

Why in news?

Recently Japan and China successfully extracted the combustible ice from the sea floor off their coastlines.

About combustible ice

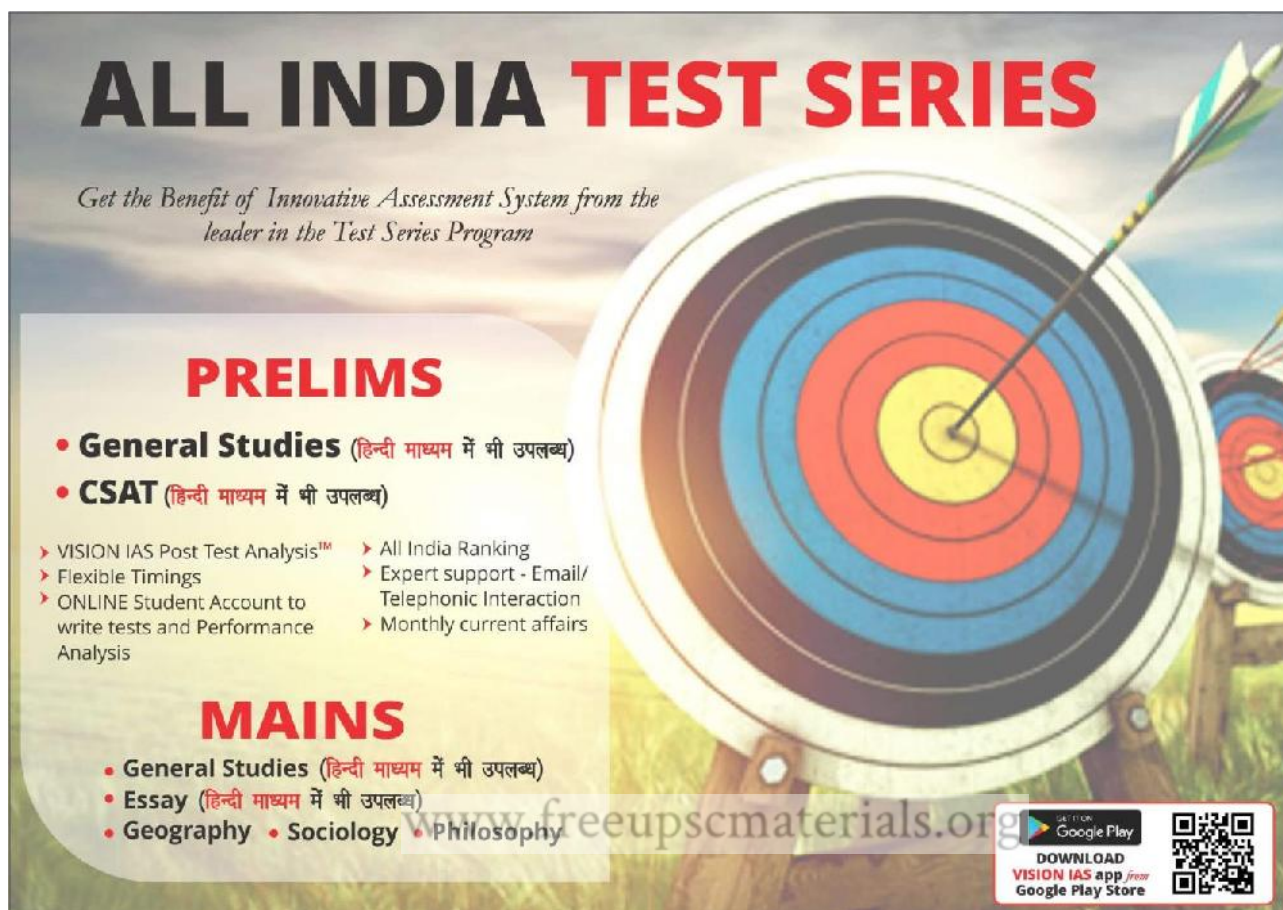
- Combustible ice is a **frozen mixture of water and concentrated natural gas**.
- Technically known as **methane hydrate**, it can be lit on fire in its frozen state and is

believed to comprise one of the world's most abundant fossil fuels.

- Methane hydrate has been **found beneath seafloors** and buried inside Arctic permafrost and beneath Antarctic ice.
- Hydrate formation is influenced by the porousness and permeability of enclosing materials.
- Estimates of worldwide reserves range from 280 trillion cubic metres up to 2,800 trillion

cubic metres, according to the U.S. Energy Information Administration.

- Methane hydrate reserves could meet global gas demands for 80 to 800 years at current consumption rates.
- Yet efforts to successfully extract the fuel at a profit have eluded private and state-owned energy companies for decades.



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5. DISASTER MANAGEMENT

5.1. CYCLONES

Why in news?

- Recently cyclone Mora affected **Sri Lanka, Andaman and Nicobar Islands, Bangladesh, Myanmar** etc. The monsoon's arrival will be delayed due to the Cyclone Mora which cooled down sea surface temperatures and reduced convection and cloud cover.
- Recently, western coast of India was hit by the tropical cyclone Ockhi.

About tropical cyclones

- Tropical cyclone is an **intense circular** storm that originates over warm tropical oceans and is characterized by low atmospheric pressure, high winds, and heavy rain.
- Tropical cyclones are known by various names in different parts of the world.** In the North Atlantic Ocean and the eastern North Pacific they are called hurricanes, and in the western North Pacific around the Philippines, Japan, and China the storms are referred to as **typhoons**.
- There are some conditions favourable for this process to take place. The conditions are:
 - The temperature of the surface layer of ocean water must be **26.5 °C (80 °F) or warmer**.
 - A **preexisting** atmospheric circulation must be located near the surface warm layer.
 - The atmosphere must cool quickly enough with height to support the **formation of deep convective clouds**.
 - The middle atmosphere must be **relatively humid** at a height of about 5,000 metres (16,000 feet) above the surface.
 - The developing system must be at least 500 km (300 miles) **away from the Equator** etc.
- About 8% of the area in the country and 1/3rd of the population are vulnerable to cyclone-related disasters in country.
- Majority of cyclones originate in the Bay of Bengal and mostly hit the east coast of the Indian subcontinent.
- World Meteorological Organisation (WMO) and the United Nations Economic and Social

Commission for Asia and the Pacific (ESCAP) started the tropical cyclone naming system in 2000.

- Eight north Indian Ocean countries — Bangladesh, India, the Maldives, Myanmar, Oman, Pakistan, Sri Lanka and Thailand, gave eight names each which was combined into a list of 64 names.
- The next cyclone will be named by India and it will be called 'Sagar'.

Increasing cyclone frequency in Arabian Sea:

According to scientist, extremely severe cyclones are becoming more frequent in the Arabian Sea particularly post-monsoon due to:

- Arabian Sea surface becomes warmer than the other ocean basins during post monsoon season.
- Weakening of winter monsoon circulation due to the interplay of global warming, climate variability and weather change.

Initiatives for cyclone management:

- NDMA has issued guidelines on cyclone management which call for
 - Establishing a **state-of-the-art cyclone early warning system (EWS)**
 - Commissioning of the **National Disaster Communication Infrastructure (NDCI)**
 - Implementing the **National Cyclone Risk Mitigation Project (NCRMP)** in all the 13 coastal states and UTs.
- ESSO-IMD (Earth System Science Organization-India Meteorological Department)** is responsible for monitoring, detection and forecasting of weather and climate extremes including severe weather events such as cyclones, heavy rainfall, extreme temperature etc.
- National Cyclone Risk Mitigation Project (NCRMP):** It aims to undertake suitable structural and non-structural measures to mitigate the effects of cyclones in the coastal states and UT's of India.
 - It is implemented by National Disaster Management Authority (NDMA) under Ministry of Home Affairs (MHA), in coordination with participating State Governments and the National Institute for Disaster Management (NIDM).



5.2. INDIAN TSUNAMI EARLY WARNING SYSTEM

Why in news?

Recently it was reported that **Indian Tsunami Early Warning System (ITEWS)** is in the process of setting upon elaborate system of sensors for real time monitoring of earthquake.

More Details on ITEWS

- Tsunami is a system of ocean gravity waves formed as a result of large scale disturbance of sea bed, mostly due to earth quake, submarine landslide or volcanic eruptions.
- Indian Ocean is likely to be affected by tsunamis generated mainly from the earthquakes from two potential source regions, the Andaman-Nicobar-Sumatra Island Arc and the Makran Subduction Zone.
- In response to the event such as December 2004 earthquake and tsunami, state-of-art **Indian Tsunami Early Warning System** at Indian National Centre for Ocean Information Centre (INCOIS), Hyderabad was established under Ministry of Earth Sciences.

Components of ITEWS

- It comprises of a real time network of seismic stations, tsunami buoys, Bottom Pressure Recorder, Tide gauge and 24X7 operational warning centre to detect tsunami-genic earthquake and monitor tsunami.
- INCOIS has also put in place a **fail-safe satellite-based communication system**; Emergency Operation Centres (EOCs), a computer-based earthquake alert and web access system etc. which is capable of sending messages and triggering built in siren alert system audible for up to 1 km.
- It is capable of sending tsunami warning in less than 10 minutes after any major earthquake of 5 magnitude and above in Indian Ocean as well as in the Global Oceans.
- ITEWS acts as a **Regional Tsunami Advisory Service Provider** along with Australia and Indonesia for the Indian Ocean region.

5.3. FLOODS

Why in news?

- From Assam and Bihar in the east to Rajasthan and Gujarat in the west, floods are creating havoc with the lives of people.

- The Union urban development ministry released a paper 'Urban Flooding — Standard Operating Procedure' that lays guidelines to be followed by various public agencies and government departments.

National commission on floods set up in 1976 for an integrated approach towards floods estimated that over 40-million-hectare area is prone to floods in our country.

River Flooding: Assam, West Bengal, Bihar and Eastern Uttar Pradesh.

Cyclone Flooding: Coastal areas of Odisha, Andhra Pradesh, Tamil Nadu and Gujarat

Flash Floods: Haryana, Uttarakhand, J&K, Bangalore etc.

Losses due to floods post 2011 are most grim for north-eastern states of Arunachal Pradesh, Sikkim, Assam and Meghalaya, and Himachal Pradesh in the north. Hilly regions suffer more due to flash floods which are difficult to predict and also cause landslides

Reason for floods in Gujarat and Rajasthan is poor drainage system while cause of Uttarakhand and Kashmir flood in 2015 & 2014 respectively was encroachment of river basin.

Urban floods are floods which occur in urban areas due to:

- Heavy rainfall
- Lack of water reservoirs such as lakes
- Silting of drainage system
- Population pressure, urbanisation and deforestation.
- Lack of flood control measures etc.

National Hydrology Project (NHP) has been taken up with the assistance of World Bank to improve the extent, quality, and accessibility of water resources information, decision support system for floods and basin level resource assessment/planning and to strengthen the capacity of targeted water resources professionals and management institutions in India.

Causes of Floods in India

- Natural causes**— includes 80% of precipitation in just 4 months, **sharp fall in gradient** of rivers in Eastern Himalayas, soft unconsolidated rocks causing heavy siltation, heavy landslides causing obstruction to river flow, storm surges or cyclones in coastal areas etc.
- Anthropogenic**— includes global warming; deforestation; encroachment of river basin; ill maintained embankments (80% have not been enforced in several decades); poor drainage and infrastructure;
- This year heavy rain is occurring in certain parts because of an **unusual formation of the**

monsoon trough, with two separate depressions present at the Arabian Sea and Bay of Bengal at the same time.

5.4. CHANGE IN DEFINITION OF DROUGHT

Why in News?

- In the 'Manual for Drought Management' released by the government in December 2016, the 'moderate' drought category has been deleted.

UPDATED NOMENCLATURE		
New terminology	Old terminology	
Normal	Normal	Percentage departure of realized rainfall is within $\pm 10\%$ of the Long Period Average
Below Normal	Below Normal	Percentage departure of realized rainfall is $< 10\%$ of the Long Period Average
Above Normal	Above Normal	Percentage departure of realized rainfall is $> 10\%$ of the Long Period Average
Deficient Year	All India Drought Year	When the rainfall deficiency is more than 10% and 20-40% area of the country is under drought conditions
Large Deficient Year	All India Severe Drought Year	When the rainfall deficiency is more than 10% and when the spatial coverage of drought is more than 40%

Details

- Indian Meteorological Department (IMD) replaced the word "drought" to describe poor rainfall with "deficient year" and "large deficient year", while incorporating standard practices from across the world.
- The change means drought-hit areas will now be categorised as 'normal' and 'severe'. Only in case of 'severe' drought, a state would be eligible for central assistance from the **National Disaster Relief Fund (NDRF)** is defined in **Section 46 of the Disaster Management Act, 2005**, is constituted to supplement the funds of the **State Disaster Response Funds.**)
- Assessment is done based on area under sowing and soil moisture-based indices.
- The new manual, gives certain indices for declaration of drought, which are:
 - Rainfall-related Indices
 - Remote Sensing-based Vegetation Indices
 - Crop situation-related indices
 - Hydrological Indices
 - Ground verification
- Except rainfall and ground verification, all other indices are considered impact indicators. To come under 'severe' drought category, a state

has to prove **severity in three out of these four** impact indicators.

- The current manual said that more than three weeks of dry spell is possibly detrimental to crop health as against less than three weeks window before.

More about droughts

- Drought is a temporary aberration**, unlike aridity or even seasonal aridity, which is a permanent feature of climate. It is a recurrent, yet sporadic feature of climate, known to occur under all climatic regimes and is usually characterized by variability in terms of its spatial expanse, intensity and duration.
- Drought stems from a deficiency or erratic distribution in rainfall but the spread and intensity of the calamity is contingent on several factors, including the status of surface and ground water resources, agro-climatic features, cropping choices and patterns, socio-economic vulnerabilities of the local population etc.
- According to the National Commission on Agriculture the 3 types of droughts are:
 - Meteorological drought:** This happens when the actual rainfall in an area is significantly less than the climatological mean of that area.
 - Hydrological drought:** A marked depletion of surface water causing very low stream flow and drying of lakes, rivers and reservoirs.
 - Agricultural drought:** Inadequate soil moisture resulting in acute crop stress and fall in agricultural productivity.

IMD can define a meteorological drought, but agricultural and hydrological droughts are different and states are better equipped to declare them.

5.5. DAM SAFETY

Why in news?

Strengthening of Bhakra Dam(Punjab) and Pong Dam (Himachal Pradesh) has been taken under the Dam Rehabilitation and Improvement plan (DRIP).

Dam Rehabilitation and Improvement Plan (DRIP)

- It is an externally-aided project. 80% of the total project is provided by the World Bank as

loan/credit and remaining 20% is borne by the States/Central Government (for CWC).

- This project started in April 2012, for repair and rehabilitation of initially 225 Dams across seven states namely Jharkhand, Karnataka, Kerala, Madhya Pradesh, Odisha, Tamil Nadu, and Uttarakhand.
- At present there are 198 Dams under this project which are scheduled for completion in June 2018.
- Objective of DRIP –
 - to improve the safety and operational performance of selected existing dams and associated appurtenances in a sustainable manner, and
 - to strengthen the dam safety institutional setup of participating States/Implementing Agencies.
- The Emergency Action Plan (EAP) for the Dams under DRIP has been proposed which is a formal plan that identifies potential emergency conditions at a dam and prescribes the procedures to be followed to minimize loss of life and property damage.

5.6. DISASTER RESILIENT INFRASTRUCTURE

Why in News?

- Indian Government recently held a two-day International Workshop on **Disaster Resilient Infrastructure (DRI)** under the National Disaster Management Authority (NDMA) in collaboration with **United Nations Office for Disaster Risk Reduction (UNISDR)**.

Background

- **Sendai Framework for Disaster Risk Reduction (2015-2030)** identifies investing in **Disaster Risk Reduction (DRR)** for resilience and to “build back better” in reconstruction as priorities.
- India is one of the first to create a **National Disaster Management Plan** based on the **Sendai Framework** for Disaster Risk Reduction.
- According to an **UN Office for Disaster Risk Reduction (UNISDR)** report, India has been ranked as the world's most disaster-prone country for displacement of residents.

Global Platform for Disaster Risk Reduction (GPDRR)

- The GPDRR is a global forum for strategic advice, coordination and review of progress in the implementation of the Sendai Framework. It marked the first opportunity since 2015 to review global progress in the implementation of SFDRR
- India participated in the five-day Global Platform for Disaster Risk Reduction (GPDRR) summit held in Cancun, Mexico. It was attended by delegates comprising heads of state, ministers, CEOs, experts etc.
- **UN Sasakawa Award** – It were issued at the 2017 Global Platform for Disaster Risk Reduction, the biennial awards recognise projects that have made a substantial contribution towards saving lives and reducing global disaster mortality

What is DRI?

Infrastructure that can stand any huge damage from any kind of natural disaster is known as Disaster Resilient Infrastructure. It encompasses structural and non-structural measures.

- **Structural Measures** involve adjusting engineering designs and standards to reflect disaster risk such as flood control systems, protective embankments, seawall rehabilitation, and retrofitting of buildings.
- **Non-structural measures** refer to risk-sensitive planning, enabling institutional frameworks, hazard mapping, ecosystem-based management, and disaster risk financing.

UNISDR was established in 1999 as a dedicated secretariat to facilitate the implementation of the **International Strategy for Disaster Reduction (ISDR)**.

- **The International Strategy for Disaster Reduction (ISDR)** is a global framework established within the United Nations for the promotion of action to reduce social vulnerability and risks of natural hazards and related technological and environmental disasters.

The Sendai Framework: is a **15-year (2015-30), voluntary, non-binding agreement** which recognizes that the State has the primary role to reduce disaster risk but that **responsibility should be shared** with other stakeholders including local government, the private sector and other stakeholders.

- It is the successor instrument to the **Hyogo Framework for Action (2005-15)**
- UNISDR has been tasked to support the implementation, follow-up and review of the Sendai Framework.
- India is a signatory of Sendai Framework.

5.7. INDIA QUAKE AND SAGAR VANI

Why in news?

Recently, Ministry of Earth Sciences launched 'India Quake' app and 'Sagar Vani' app to enable users receive information about natural hazards on land and water.

About India Quake App

- It has been developed by **National centre for Seismology** for **automatic dissemination** of earthquake parameter such as **location, time and magnitude** after the occurrence of Earthquake and avoid delay of information in the event of earthquake.

About Sagar Vani App

- Sagar Vani app** has been developed by **ESSO-Indian National Centre for Ocean Information Services (INCOIS)** under Ministry of Earth Sciences.

- It is a software platform which uses state of art technology for dissemination of ocean related information and advisory services such as Potential Fishing Zone (PFZ) advisories, Ocean State Forecast (OSF), High Wave Alerts and Tsunami early warnings.

National Centre for Seismology

It is an **umbrella organisation** which has been set up **to bring all the earthquake related activities of IMD** together for deriving the desired scientific developments in the field of earthquake science.

ESSO – Indian National Centre for Ocean Information Services (INCOIS)

It was set up as an autonomous body under the Ministry of Earth science and is a unit of Earth System Science Organization (ESSO).

It is mandated to provide information and advisory services to government agencies, industries etc. through sustained ocean monitoring and constant improvement through systemic and focussed research.

6. GEOGRAPHY

6.1. EXPLORATION OF POLYMETALLIC NODULES

Why in news?

India's exclusive rights to explore polymetallic nodules from seabed in Central Indian Ocean Basin (CIOB) have been extended by five years by International Seabed Authority, till 2022.

Details

India is the first country to have received the status of a pioneer investor in 1987 and was allocated an exclusive area in Central Indian Ocean Basin by United Nations (UN) for exploration and utilization of nodules.

- India is implementing a long-term programme on exploration and utilization of Polymetallic Nodules (Polymetallic Nodules programme) through Ministry of Earth Sciences.
- India is presently having an area of 75,000 square km, located about 1600 km away from her southern tip. Polymetallic nodules resource potential in this site is 380 million tonnes.
- Recently, **Geological Survey of India**, (an attached office under Ministry of Mines) has confirmed presence of micro manganese nodules around Lakshwadeep sea. It has also confirmed presence of Phosphate sediment off Karwar, Mangaluru and Chennai coast; Gas Hydrates in Mannar Basin and Cobalt bearing ferro manganese crust from Andaman sea.

Polymetallic nodules: A brief

What is it? Polymetallic nodules, also called manganese nodules, are rock concretions formed of concentric layers of iron and manganese hydroxides around a core.

- Besides manganese and iron, they contain nickel, copper, cobalt, lead, molybdenum, cadmium, vanadium, titanium and rare earth metals.

Distribution: Three areas have been selected by industrial explorers: the centre of the north central Pacific Ocean, the Peru Basin in the south-east Pacific Ocean and the centre of the north Indian Ocean. They can occur at any depth, but the highest concentrations have been found between 4,000 and 6,000m.

International Seabed Authority (ISA) is a UN body set

up to regulate the exploration and exploitation of marine non-living resources of oceans in international waters. Recently, India was re-elected as a member of Council of ISA.

The Polymetallic Nodules Programme (PNP): PNP is oriented towards exploration and development of technologies for eventual extraction of nodules from the Central Indian Ocean Basin (CIOB) allocated to India. It consists of four components viz. Survey and Exploration, Environmental Impact Assessment (EIA) Study, Technology Development (Mining) and Technology Development (Extractive Metallurgy).

Present status: The extraction of metals from the polymetallic nodules lying at the deep ocean floor is not yet found to be economically viable at this stage. However, a site has been identified in the CIOB for the First Generation Mine Site on the basis of detailed surveys and analysis.

6.2. SEDIMENTARY BASINS OF INDIA

Why in news?

- Recently, Cabinet Committee on Economic Affairs gave its approval to acquire 48,243 Line Kilometer (LKM) **2D seismic data** for appraisal of **Indian sedimentary basins by 2019-20**, for prospecting of oil and natural gas reserves.

Background

- India has 26 sedimentary basins covering an area of 3.14 Million sq. km spread over on land, shallow water and deep water out of which 48% of total sedimentary basin area does not have adequate geo-scientific data.

Sedimentary basins are regions where considerable thicknesses of sediments have accumulated (in places up to 20 km). Sedimentary basins are widespread both onshore and offshore.

Importance:

- They are the **location for almost all of the world's hydrocarbon reserves**
- Other mineral:** Include coal and uranium, large deposits of phosphate (an essential fertiliser mineral) and a host of industrial raw materials, including limestone for cement manufacture, kaolinitic clays, gypsum and salts.
- Metalliferous deposits (in less amount)** include ores of lead, zinc, iron and manganese, and there may also be some bauxite.
- There are 26 sedimentary basins in India of which **7 are operational:** Assam-Arakan, Cambay,

Cauvery, Krishna-Godavari Offshore, Mumbai Offshore and Rajasthan. Recently, after a gap of over three- decades, state-owned Oil and Natural Gas Corp is set to open a new sedimentary basin in the country called as Kutch offshore.

6.3. COASTAL EROSION

Why in News

- According to a study, Parali 1 island (part of Bangaram atoll), one of biodiversity-rich uninhabited islands part of Lakshadweep has disappeared due to coastal erosion and another four such islands in Lakshadweep sea are shrinking fast.

Coastal Erosion in India

- According to MOEF&CC, 40% of the Indian 8,414-km long coastline is subjected to coastal erosion (either high, medium or low).
- The west coast of our country is a high rocky retreating coast, therefore erosional forms dominate in the west coast. Whereas, the east coast of India is a low sedimentary coast and is dominated by depositional forms (Accretion).
- The **Earth Sciences Ministry**, monitors the shoreline changes along the Indian coast on an annual basis. Some of the recent finding are:
 - The Andaman and Nicobar Islands face the **most erosion**, with close to 89% of the shoreline eroded by the Bay of Bengal.
 - At the other end of the spectrum is Tamil Nadu, which has **gained the newest shoreline (Accretion: a gradual deposition by water of mud, sand to form dry land)**, with 62% of its coast gaining land.

Reason for coastal erosion

- Wave energy** is the main cause of coastal erosion.
- Climate Change:** induced global warming and the melting of ice sheets and continental glaciers continually **increase the sea level**, which leads to storm surges, thermal expansion of sea water and cyclones.
- Coast is also subject to a **strong littoral drift** in India, causing an estimated 1.5 million tons of sand to move from the southwest to the northeast in a year.

- Construction of dams in catchment areas of rivers and ports and reduced the flow of sediment from river estuaries contributes to coastal erosion.
- Sand, coral mining and dredging can cause coastal erosion.

Measures to deal with coastal erosion:

- Interventions such as **saline stone-packaging and breakwaters**, structures which are constructed on coasts are traditionally made as part of coastal defence.
- To prevent erosion of the coast, **low walls called groynes** are built out into the sea.
- Geo-Synthetic Tubes**, a soft engineering technique, which has been used along Odisha coast.
- Vegetation:** Important for improving slope stability, consolidating sediments and providing some shoreline protection.
 - Coastal Green Belts** which includes **Social forestry, Eco-development, Participatory planning, implementation and monitoring.**

6.4. PACIFIC SHADOW ZONE

Why in news?

According to a recent research paper it was found that at around 2km below the surface of the Indian and Pacific Oceans there is a 'shadow zone'.

What is a Shadow Zone?

- It is an area of **almost stagnant water** which is sitting between rising currents caused by the **rough topography and geothermal heat source** and shallower **wind-driven current** closer to the surface in the North Pacific.
- Carbon-14 dating has proved that there is oldest water in the North Pacific Ocean. The trapped water also traps nutrients and carbon which have a direct impact on the capacity of the ocean to modify climate over centennial time scales.
- The deep-water movement called **abyssal overturning circulation** is due to the geometry of the seafloor which after a long period of time prevents very deep, dense ocean water from circulating to the surface.
- The Geothermal energy deep within the planet was unable to rise and instead of travelling upwards, currents loop back on



them horizontally leaving the layer above untouched.

- Atlantic Ocean and Southern Ocean do not have similar feature however researchers say a similar zone is present in Indian Ocean. However, the water is less stagnant due to proximity to fresh water from Antarctic Ocean.

6.5. EL NINO AIDED IN MASSIVE CARBON DIOXIDE RELEASE

Why in news?

- Recently, scientist concluded that El Nino of 2014-16 caused **over 3 billion tonnes of carbon** to get released into the atmosphere, pushing **carbon dioxide concentration to record levels**.
- In July 2017, Study links extreme El Nino conditions and warming of Bay of Bengal to very heavy rainfall during the northeast monsoon and Chennai.

El-Nino

- The unusual warming of surface waters in the eastern tropical Pacific Ocean.
- El Niño has an impact on:
 - ocean temperatures,
 - the speed and strength of ocean currents
 - the health of coastal fisheries
- El Niño events occur irregularly at two- to seven-year intervals.
- Recognized by fishers off the coast of Peru as the

appearance of unusually warm water.

- El Nino generally causes less than normal rainfall in the case of the southwest monsoon
- In contrast, it brings about above-normal rainfall during the northeast monsoon.
- This is because of the difference in seasonal wind patterns between the two monsoons.
- Consistent warming of the Bay of Bengal off the coast of Tamil Nadu and Andhra Pradesh also played an important role

La Nina

- La Niña, the direct opposite of El Niño, occurs when sea surface temperatures in the central Pacific Ocean drop to lower-than-normal levels.
- It is associated with the cooling of the eastern equatorial Pacific Ocean which favourably impacts the four-month long (June to September) south-west monsoon in India, critical to the rain-fed farming season which begins in June.

Highlights

- Scientists analysed the data collected by **Nasa's Orbiting Carbon Observatory-2 (OCO-2) satellite**, which measures level of carbon dioxide in the atmosphere.
- The El Nino led to excessive carbon dioxide releases in following ways:
 - **Hot weather and drought** caused extensive wildfires in south-east Asia.
 - **Drought in the Amazon rainforest** stunted plant growth, reducing the amount of carbon they absorb while growing.



7. MISCELLANEOUS TIT BITS

- The International Tropical Timber Organization (ITTO) was established under the auspices of the United Nations in 1986 amidst increasing worldwide concern for the fate of tropical forests.
 - ITTO develops internationally agreed policy documents to promote sustainable forest management and forest conservation and assists tropical member countries to adapt such policies to local circumstances and to implement them.
 - India is among the members of ITTO.
- Recently, a long-range missile test facility at South Andamans' Rutland Island has secured the clearance of the National Board of Wildlife.
 - The proposal involves diversion of forest some of which falls in the **Mahatma Gandhi Marine National Park**. The island was once home to the indigenous Andamanese group 'Jangil' or Rutland Jarawa.
- Recently the SAARC Disaster Management Centre at the Gujarat Institute of Disaster Management (GIDM), Gandhinagar was inaugurated.
- Scientists in India for the first time have discovered a 152 million-year-old fossil of an **Ichthyosaur** - an extinct marine reptile - in Gujarat.
- Recently, the country's first under water tunnel under the Hooghly river for establishing metro link between Howrah and Kolkata was completed.
- The National Board of Wildlife (NBWL) is planning to give clearance to the Mandal Dam on **North Koel river** after it studies the dam's potential impact on the Palamu Tiger Reserve's (PTR) ecosystem.
 - The Palamu Tiger Reserve is located in the western side of Latehar district on the Chhotanagpur plateau in **Jharkhand**.
 - The project area is **constituted mainly of Sal forests, mixed deciduous forests and bamboo groves**.
 - The reserve zone is the watershed area for 3 important **rivers Koel, Burha and Auranga**.
- Recently a White tiger has been spotted in Nilgiri
 - Only around 200 of the white tigers are left in the world and Bandhavgarh (MP) is world's first white tiger sanctuary.
 - It is the result of a mutation and not a sub-species, for a white Bengal tiger to be born, both parents must carry the unusual gene for white colouring. This double recessive allele in the genetic code only turns up naturally about once in 10,000 births.
- Recently, Sikkim government allowed people to forge fraternal ties with trees as a means of preservation by encouraging people to forge a relationship of brotherhood or sisterhood with trees it is a practice locally known as **Mith/Mit or Mitini**.
- **Schistura larketensis** or '**Khung Loach**' is a new species of **eyeless fish** discovered inside a cave in **East Jaintia Hills** district of **Meghalaya**. The species has **lost its eyes and pigment** while **adapting** to living in perpetual darkness inside the cave.
- A high-altitude cloud observatory has been established at **Munnar** in Kerala. This observatory is the **highest elevation cloud physics observatory** in the **Tropical region** over the **south Asia**. The observatory will be **used to study about**: physical processes that lead to the formation, growth and precipitation of atmospheric clouds, short period development of convective storms, heavy rainfall and lightning in tropics, clouds microphysics, atmospheric electricity and vertical profiles of atmosphere.
- Department of Biotechnology '**Biotechnology Social Development Award** has been given to **Himalayan Environmental Studies and Conservation Organization (HESCO)**, Dehradun, Uttarakhand, for their pioneering work on creating livelihood options for rural community in the Himalayan region.
- **Nalanda model of water conservation (Project Jal Sanchay)** has been selected for the national for award for excellence in the Mahatma Gandhi national rural employment guarantee programme (MGNREGP). Under it check dams were created and traditional Aahar-Pyne irrigation system and traditional water bodies were desilted and renovated,



accompanied by campaigns to create awareness about rainwater harvesting.

- **Sentinel-5P satellite of European Union** tracking the levels air pollutants around the world has beamed back new views of the Earth's atmosphere, including images of pollution drifting away from power plants in India. As per the satellite's data, in India the worst of pollution runs from north of Patna in Bihar to south of Raipur in Chhattisgarh.
- Maharashtra state cabinet recently approved the Favourable Climate change policy focusing on '**Climate proof**' village (a village in which sustainable practices are adopted such as zero-till farming, integrated nutrient and water management and proper harvesting and storage.).
- "**Wood is Good**" Campaign under the **Partnership for Land Use Science (Forest-Plus)** (a partnership between USAID and MoEFCC) has been launched to promote wood as a climate-friendly resource and a substitute to materials like plastic and steel because it is carbon neutral.
- Government has set up a committee for North- East India in the aftermath of destructive flood in the region to develop a strategy for management of region's water resources. Ministry of Development of North-Eastern Region will be coordination agency and the committee will submit the plan of action by June 2018.
- **Local Treatment of Urban Sewage Streams for Healthy Reuse (LOTUS^{HR})** an Indo-Netherlands joint project funded by Department of Biotechnology(DBT) and NWO/STW (Netherlands Organisation for Scientific Research) has been taken up for the cleaning and beautification work of the Barapullah Drain, New Delhi.

- India has set up its largest floating solar power plant in **Banasura Sagar dam** in **Wayanad**, Kerala.
 - Banasura Sagar dam is built using waters of a **tributary of river Kabini** which is **in turn a tributary of the river Cauvery**.
 - They have higher efficiency due to the moderating effect of water bodies on panel temperature.
 - The floating panels accumulate lower concentration of dust.
- Recently, IUCN has categorized the Christmas Island **Pipistrelle** (a bat species that is found only in Australia's Christmas Island) as **officially extinct**.
- A new species of frog Bhupathy's purple frog (*Nasikabatrachus bhupathi*) was discovered which has purple skin and a pointy pig-nose on the eastern slopes of the Western Ghats near the Srivilliputhur Grizzled Giant Squirrel Wildlife Sanctuary in Tamil Nadu.
 - **Significance** – It constitutes additional evidence in favour of **Theory of Continental Drift**. The Purple Frog is an inhabitant of Seychelles and discovery of Bhupathy's purple frog in India suggests that Indian Subcontinent was part of **ancient Gondwana** before splitting and drifting northwards 65 million years ago.